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Payment and Settlement Systems Report 2024

2025. 4

BANK OF KOREA

Bank of Korea Mid- and Long-term Strategic Plan (BOK 2030)

• **Vision**	**Bank of Korea** **: Taking the lead in stabilizing and developing the national economy**	
• **Strategic Directions**	**A**gility	Pursue Innovation in a Flexible and Swift Manner
	Collaboration	Bolster Synergy Through Collaboration
	Expertise	Reinforce Policy and Research Capability

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"Payment and settlement" refers to the act of discharging obligations arising from economic activities between individuals and businesses by means of payment instruments, such as cash, payment cards, or funds transfers. In order to ensure that payment and settlement transactions that support economic activities take place smoothly, payment and settlement systems, comprised of payment instruments, payment systems, and participating institutions, need to be managed and operated in a stable and efficient manner.

In its capacity as the central bank, the Bank of Korea (BOK) plays a pivotal role in ensuring the smooth operation and development of payment and settlement systems in Korea, in accordance with the Bank of Korea Act. The BOK operates BOK-Wire+, a large-value payment system that finalizes settlements between financial institutions, and provides financial institutions with intraday liquidity support to resolve settlement risks, such as those arising from settlement delays. The BOK also conducts oversight of payment and settlement systems by monitoring and assessing operating institutions and by making recommendations for improvements as necessary.

The Payment and Settlement Systems Report 2024 summarizes the BOK's work during 2024 related to the operation, oversight, and innovation of payment and settlement systems, including changes made to them in the period up to March 2025, and sets out future policy directions. The goal of this report is to enable system participants and the public to gain a greater overall understanding of the various payment and settlement systems in Korea.

Excerpts from the Bank of Korea Act

Article 28. Decisions on Monetary and Credit Policies The Monetary Policy Board shall deliberate and decide on matters involving the following clauses on monetary and credit policies.

10. Basic matters for the operation and management of the payment and settlement systems according to the provisions of Article 81.

Article 81. Business Concerning Payment and Settlement Systems (1) For the purpose of promoting the safety and efficiency of the payment and settlement system as a whole, the Bank of Korea may determine all the necessary matters concerning the payment and settlement systems that it operates.

(2) Concerning the payment and settlement systems that are operated by institutions other than the Bank of Korea, the Bank of Korea may if necessary request such operating institutions or the supervisory body responsible to take measures for the improvement of the operating rules, or other matters.

(3) For the purpose of the smooth operation of overall payment and settlement systems, the Bank of Korea may require institutions operating payment and settlement systems referred to in Paragraph 2, above, to provide materials related to payments and settlements. In such cases, the operating institutions shall comply.

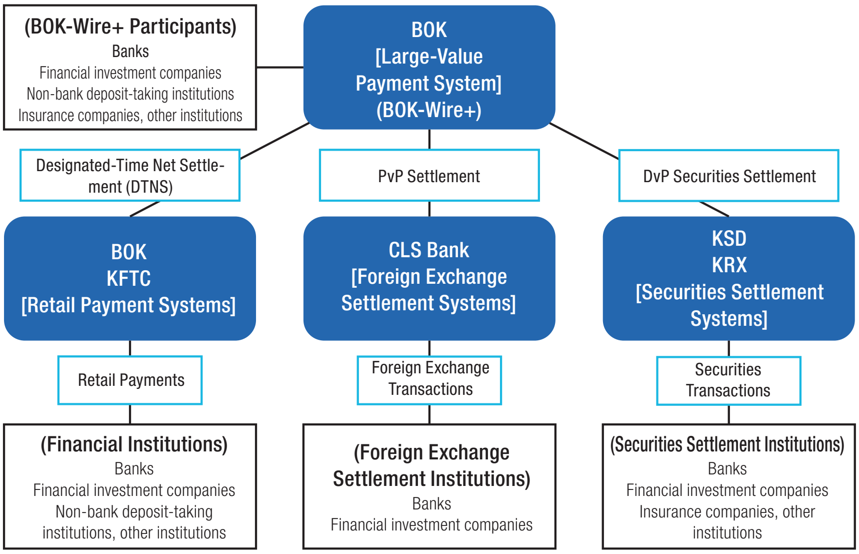
(4) The Bank of Korea may require participant institutions of payment and settlement systems operated by the Bank of Korea referred to in Paragraph (1) to provide any relevant materials.

Article 81-2. Support to Settle Temporary Shortages The Bank of Korea may, as determined by the Monetary Policy Board, temporarily provide intraday funds to participant institutions of payment and settlement systems operated directly by the Bank of Korea to meet any shortage of funds.

Overview of Payment and Settlement Systems in Korea

Payment and settlement systems in Korea consist of a network of interconnected subsystems. At the top of the hierarchy are the retail payment systems operated mostly by the private sector, foreign exchange settlement systems, and securities settlement systems connected to BOK-Wire+, the main large-value payment system operated by the BOK.

Legacy services, including promissory notes, checks, funds transfers, and payment card services, are provided by individual financial institutions. In recent years, fintech and other non-financial corporations have begun to offer an increasingly wide range of services, such as issuing prepaid electronic payment instruments and providing payment processing services.



□ BOK-Wire+ is a real-time gross settlement (RTGS) system that enables participants to use their current accounts with the BOK to initiate large-value funds transfers to settle mutual obligations resulting from various financial transactions, including calls, securities, and foreign exchange transactions.

○ Management of Settlement Risk

The BOK provides intraday liquidity support to BOK-Wire+ participants to alleviate the burdens associated with sourcing and managing settlement liquidity in real time. It is conducted in the form of intraday repos or the provision of intraday overdrafts to address liquidity needs that are transitory in nature.

☐ Retail Payment Systems

Funds transfer instructions by individuals and businesses are processed through retail payment systems operated by the Korea Financial Telecommunications and Clearings Institute (KFTC), either on a real time or batch processing basis. The final settlement of obligations between financial institutions takes place through BOK-Wire+ on the following business day at a designated time.

○ Management of Settlement Risk

The BOK directly manages net settlement risk for the retail payment systems. Participants are required to set a self-assessed net debit cap and pledge eligible collateral with the BOK, in amounts equal to or greater than a certain percentage of the net debit cap.

☐ Foreign Exchange Settlement Systems enable financial institutions to settle obligations resulting from foreign exchange transactions by companies and individuals between different currencies.

○ Management of Settlement Risk

To eliminate foreign exchange settlement risk, sold and bought currencies are settled simultaneously through the CLS Bank on a payment-versus-payment (PvP) basis.

☐ Securities Settlement Systems are systems in which stock and bond transactions by investors are settled through the transfer of securities between the custody accounts of financial investment companies and other financial institutions held at the Korea Securities Depository (KSD).

○ Management of Settlement Risk

A delivery-versus-payment (DvP) system is in place to ensure the simultaneous exchange of security deliveries and fund payments by linking KSD's securities settlement systems with BOK-Wire+.

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Guide to Using URLs and QR Codes for Related Materials

☐ In order to promote user convenience, the Payment and Settlement Systems Report 2024 contains URLs and QR codes that directly link to materials uploaded onto the Bank of Korea's website and YouTube channel.

☐ Readers of this report using a personal computer or tablet can access related material by clicking the URLs included in the report. For the printed version, users may access related material by scanning the QR codes included in the report with a smartphone.

Digital file of the report	Click the URLs included in the report to directly access related material. www.bok.or.kr/123456789
Printed version of the report	Scan the QR codes included in the report at the end of each chapter or section with a smartphone.

Executive Summary

In 2024, innovation in payment and settlement systems continued apace amid growing momentum in the digital transformation of finance. The Act on the Protection of Virtual Asset Users entered into force to safeguard the assets of virtual asset investors, and discussions were held on additional legislation to introduce entry and operation regulations as well as a regulatory framework for stablecoins. The international community's efforts to improve payment and settlement infrastructures also saw success, including the implementation of the G20 Roadmap for Enhancing Cross-Border Payments and the adoption of ISO 20022. Meanwhile, the TMON-WeMakePrice event highlighted the need to improve supervisory regulations governing payment gateways (PGs) to better protect consumers.

In the face of the evolving payment and settlement landscape, the BOK undertook wide-ranging efforts to enhance the safety and efficiency of the payment and settlement systems. BOK-Wire+ reliably and efficiently provided final settlement services for transactions, including funds transfers between BOK-Wire+ participants, retail payments and securities settlements, and foreign exchange payment-versus-payment (PvP) settlements. In connection with the progressive upward adjustments to the net-settlement collateral ratio, the BOK expanded the range of net settlement collateral-eligible securities in order to reduce the resulting burdens on participants. The BOK continued robust oversight of payment and settlement systems, conducting assessments of payment and settlement systems and joint examinations of financial companies. Virtual asset markets were monitored and analyzed by requesting the submission of data from virtual asset service providers. The coverage of mobile cash card services was expanded to further facilitate the public's access to cash. The BOK made sustained efforts to improve payment and settlement infrastructure, including preparing to implement an real-time gross settlement (RTGS)-based fast payment system and to adopt ISO 20022, while also operating a task force to enhance cross-border payment services. In collaboration with the Financial Services Commission (FSC) and the Financial Supervisory Service (FSS), the BOK also prepared for Project Hangang to assess the feasibility of introducing a digital money.

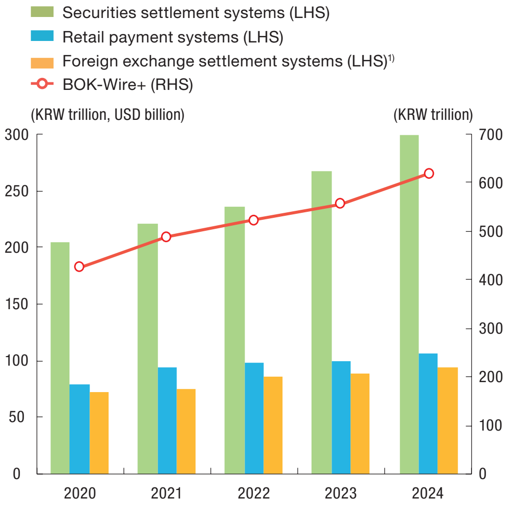
Looking ahead, the BOK plans to continue to expand domestic payment and settlement infrastructure, strengthen efforts to monitor and analyze virtual asset markets, develop a suitable and thriving payment and settlement ecosystem in keeping with the digital transformation of the economy, and establish an appropriate regulatory framework. Moreover, the BOK will actively contribute to global dialogues and international efforts for the innovation of payment and settlement systems, including the interlinking of national payment systems, and also implement these efforts domestically.

[Payment and Settlement Trends and Settlement Risk Management]

1 In 2024, the value of transactions settled through major payment and settlement systems increased, led by securities settlement and electronic funds transfers by individuals and businesses.

In 2024, the daily average value settled in BOK-Wire+ climbed by 11.2% over the prior year to KRW 617.0 trillion on the back of a sharp rise in securities settlement funds. Among the payment and settlement systems connected to BOK-Wire+, the daily average value settled in securities settlement systems jumped 21.4% to KRW 325.8 trillion, bolstered by a surge in inter-institutional repo transactions. The daily average value settled in retail payment systems reached KRW 106.4 trillion, a 6.4% increase compared to a year earlier, reflecting the expanded volume of funds transfers conducted through the Electronic Banking System, including internet banking, and the Open Banking System. The daily average value of foreign exchange transactions settled through the CLS system stood at USD 94.2 billion, representing a 5.9% increase over the previous year.

Settlement value processed by major payment and settlement systems (daily average)



Note: 1) Based on the value settled through the CLS system, expressed in billions of USD.
Sources: Bank of Korea, KFTC, KRX, KSD.

2 Settlement risk in major payment and settlement systems was appropriately managed.

During 2024, the BOK reliably and efficiently provided final settlement services through BOK-Wire+ for transactions, including funds transfers between BOK-Wire+ participants, retail payments and securities settlements, and foreign exchange PvP settlements.

The maximum intraday overdraft cap utilization rate[1] (daily average), an indicator of BOK-Wire+ participants' settlement liquidity, saw a moderate uptick from 20.9% a year earlier to 22.7%.[2] Meanwhile, the proportion of payment orders

1) This is the ratio of maximum utilization out of the intraday overdraft cap. An intraday overdraft is automatically executed when a participant submits a payment or settlement order in excess of the current account balance. The amount of an intraday overdraft is limited to the value of eligible collateral pledged by the participant to the BOK. For example, if a participant's intraday overdraft cap is KRW 100 billion and its maximum utilization is KRW 22.7 billion, the maximum intraday overdraft cap utilization rate would be 22.7%.
2) This was caused mainly by the increase in intraday overdrafts incurred by the foreign bank branches in Korea.

in the queue for settlement[3] (daily average) was 5.0%, virtually unchanged from the previous year (4.9%).[4]

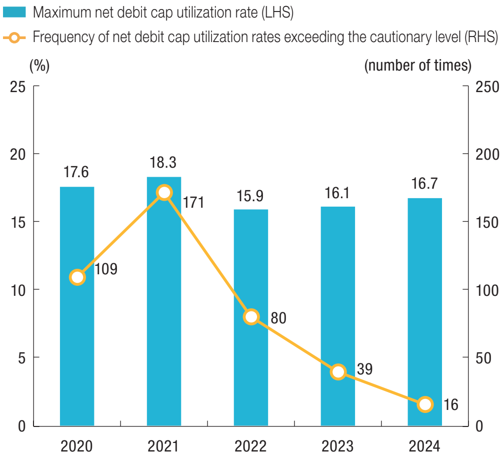
Maximum intraday overdraft cap utilization rate and proportion of payment orders in the queue for settlement (based on value)

(%)

	2020	2021	2022	2023	2024
Maximum intraday overdraft cap utilization rate[1]	23.5	20.3	23.0	20.9	22.7
Proportion of payment orders in the queue for settlement[2]	3.3	3.7	4.1	4.9	5.0

Notes: 1) Average ratio of the daily maximum utilization of net intraday overdrafts out of the intraday overdraft cap (only for banks).
2) Total value of payments in the queue relative to gross settlement value (excluding payments processed through multilateral netting for liquidity savings).
Source: Bank of Korea.

Maximum net debit cap utilization rate[1] (daily average) and frequency of net debit cap utilization rates exceeding the cautionary level of 70%



Note: 1) Average daily maximum net debit cap utilization rate of all participants.
Source: Bank of Korea.

In 2024, the maximum net debit cap utilization rate[5] (daily average) of retail payment system participants increased slightly to 16.7% from 16.1% a year earlier. However, the frequency of participants' net debit cap utilization rates exceeding the cautionary level (70%) fell sharply from 39 to 16 times during the same period.[6]

Meanwhile, the securities settlement systems of the Korea Exchange (KRX) and the Korea Securities Depository (KSD) operated stably. All transactions in exchange-traded stocks and government bonds were settled before the penalty deadline. In the inter-institutional repo and OTC bond markets, the proportion of transactions settled on a delivery-versus-payment (DvP) basis, which simultaneously delivers securities and corresponding funds so as to eliminate settlement risk, all edged higher, continuing the upward trend from the previous year.

3) This is the proportion of payment orders that were temporarily placed in the queue due to insufficient funds in a participant's current account and eventually cleared among the total value of settlements processed through BOK-Wire+. For example, if the total value of payment orders submitted by a participant is KRW 100 billion and KRW 5 billion worth of payment orders are placed in the queue, the proportion of payment orders in the queue for settlement would be 5%.
4) Most payment orders in the queue are those initiated by financial investment companies. As no reserve requirements exist for these companies, they do not maintain sufficient account balance at all times. Because of this, a rise in the value of settlements based on inter-institutional repo transactions tends to drive up the value of payment orders in the queue.
5) Each new customer transfer order issued by a participant reduces the available portion of the net debit cap, which is replenished when incoming customer transfers are received by other participants. To reduce settlement risk in retail payment systems, the BOK requires participants to pledge collateral equal to a certain percentage of their net debit caps.
6) This is mainly due to the BOK's guidance on establishing measures to manage the net debit cap utilization rates of participants, as well as participants' strengthened monitoring of their net debit cap utilization rates.

Proportion of DvP in OTC transactions[1)2)]

(%)

Type	2020	2021	2022	2023	2024
Inter-institutional repos	94.1	94.1	94.5	95.7	95.9
OTC bonds	90.3	90.5	93.8	97.3	97.5

Notes: 1) Proportion of total settlement value made through BOK-Wire+ (DVP).
2) OTC bonds include CDs, CP, and electronic short-term bonds (based on final settlement value after continuously netting receivables and payables in chain settlement).
Source: KSD.

[Enhancement of the Safety and Convenience of Payment and Settlement Systems]

3 The net-settlement collateral ratio was increased and the analysis of virtual assets was strengthened. A new financial solvency standards criterion was adopted for non-bank deposit-taking institutions' participation in BOK-Wire+.

International standards recommend that credit risk in payment and settlement systems be fully covered.[7)] In keeping with this recommendation, since 2016, the BOK has made progressive upward adjustments to the collateral ratio related to the net settlement obligations of retail payment system participants, raising it gradually from an initial 30% to 100% of the net debit cap. However, during the COVID-19 pandemic, planned increases to the collateral ratio were postponed or the collateral ratio was temporarily lowered in some cases as part of the measures undertaken to stabilize the financial markets.

In August 2023, when relative stability was restored in the financial markets, the BOK raised the net-settlement collateral ratio to 80% from the previous 70%. In August 2024, it was again raised from 80% to 90%. The net-settlement collateral ratio is scheduled to rise to 100% in August 2025. Once this ratio is brought to 100%, some updates will be made to other risk management mechanisms, including the discontinuation of the loss-sharing arrangements for retail payment systems operating under the net debit cap.

Net-settlement collateral ratio[1)]

(%)

Apr. 2020	Feb. 2022	Aug. 2023	Aug. 2024	Aug. 2025
50	70	80	90	100

Note: 1) (∑Post-haircut value of collateral/net debit cap)×100.
Source: Bank of Korea.

In July 2024, a new system was set up to automatically review the adequacy of collateral haircuts[8)] so that haircuts applying to net settlement collateral can be quickly reassessed, when warranted by changes in financial market conditions, and necessary actions can be taken. In September 2024, to reduce the burden on

7) The Core Principles for Systemically Important Payment Systems, which used to be international standards in the payment and settlement sector, recommended that participants reduce the size of credit risk by establishing a net debit cap without prescribing a target level. However, following the global financial crisis, the Principles for Financial Market Infrastructures (PFMI), established in 2012, strengthened risk management standards, including the recommendation to secure collateral sufficient to fully cover participants' credit risk.

8) The adequacy of a haircut ratio is assessed by comparing the post-haircut value of a security with its value calculated by reflecting the latest level of interest rate volatility. In the newly implemented system, the collection and processing of necessary valuation data, as well as the application of collateral securities assessment model (Value at Risk, or VaR), which takes into consideration interest rate volatility, is fully automated.

financial institutions resulting from a higher collateral ratio, the BOK expanded the range of net settlement collateral-eligible securities to include covered bonds.[9)]

Expansion of the coverage of eligible securities for net settlement collateral requirements

Eligible collateral securities	Change
· Government bonds, monetary stabilization bonds, government-guaranteed bonds, Korea Housing Finance Corp. MBSs, special bank bonds	—
· Bank bonds, securities issued by nine public institutions, other public institution bonds, local government bonds, prime corporate bonds	Range extended (July 2023)
· Covered bonds	Newly added (September 2024)

Source: Bank of Korea.

Following the entry into force of the Act on the Protection of Virtual Asset Users on July 19, 2024, which grants the BOK the right to request the submission of data from virtual asset service providers,[10)] the BOK amended the "Regulation on the Bank of Korea's Request for Examination of Financial Institutions." As part of this, requirements for requesting the submission of data were established, including the types of entities subject to the request and the scope of data that can be requested. During 2024, the BOK requested the submission of data to monitor virtual asset markets and it will further intensify its monitoring and analysis of these markets. For stablecoins,[11)] which have the potential to scale as payment instruments, more in-depth data will be collected, including transaction volumes and cross-border flows. These data will be utilized in the analysis of vulnerabilities in domestic virtual asset markets and the impact of their growing interconnectedness with the traditional financial system. The results of the analysis will be reflected in future monetary and credit policies and used to improve the BOK's operation of payment and settlement systems and financial stability-related business.

In consideration of the rising influx of deposits into non-bank deposit-taking institutions and the impact of advances in the digitization of finance on financial stability, in February 2024, the BOK decided to include federations of non-bank depository institutions and mutual savings banks among eligible counterparties to its open market operations. Moreover, the BOK revised the "Sub-Regulation on the Operation and Management of the Payment and Settlement Systems" to stipulate requirements for the participation in BOK-Wire+ by these institutions. While the

9) Covered bonds are long-term bonds issued by financial institutions that are secured by a separate pool of high-quality assets (residential mortgages, etc.), known as the cover pool. By providing investors with an extra layer of credit protection, issuing institutions are able to raise funds for longer durations at lower interest rates. The advantage for investors is that covered bonds are safer from bankruptcy risk than general secured bonds or asset-backed securities (ABS) due to the dual recourse protection whereby they have a claim on both the issuing institution and the underlying asset pool. Underlying assets in the cover pool can be redeemed or sold while the bond is outstanding. In such cases, the redeemed or sold assets are replaced with equivalent assets to continue to provide security to investors. Due to these characteristics, covered bonds are considered a stable long-term investment vehicle.

10) Article 16 (Requests for Submission of Data by the Bank of Korea) of the Act on the Protection of Virtual Asset Users: If deemed necessary by the Monetary Policy Board to implement monetary and credit policies and to facilitate the smooth operation of payment and settlement systems in relation to virtual asset transactions, the Bank of Korea may request a virtual asset service provider to submit data. In such cases, the data requested shall be limited to a minimum extent necessary, fully taking into account the workload of the relevant virtual asset service provider.

11) Stablecoins are virtual assets that are designed to minimize price volatility by pegging their value to a legal tender (e.g., Tether, USD Coin).

participation requirements for non-bank depositing-taking institutions are, for the most part, the same as those for other types of financial institutions, a new financial solvency standards criterion was introduced to take into account their special risk profiles.[12] This allowed the scope of BOK-Wire+ participants to be expanded while ensuring the stable operation of the large-value payment system.

Meanwhile, for early detection of warning signs of a bank run and a timely response, the BOK is conducting research into the application of AI to monitor funds transfer data of retail payment systems in real time.[13] Through this research, an AI model is under development to analyze real-time funds transfers initiated in retail payment systems operated by the KFTC and to detect, in a timely manner, negative news about a financial institution that spread on news websites and social media. After sufficient validation, these AI models will be used as assistive tools to monitor for troubling signs in retail payment systems.

4 The BOK made sustained efforts to improve the public's access to cash by expanding the coverage of mobile cash card services and enhancing the convenience of CD/ATM use for persons with disabilities.

On December 2023, the Committee on Financial Informatization Promotion (CFIP), chaired by the Senior Deputy Governor of the BOK, in cooperation with the Korea Financial Telecommunications and Clearings Institute (KFTC) and 17 domestic financial institutions, rolled out a new feature for mobile cash cards[14] that allow users to conduct cardless ATM transactions using a universal QR code. Since then, the usage of mobile cash card ATM services has increased considerably. Going forward, to further enhance the convenience of ATM transactions for the public, the CFIP will extend the supported network of ATMs to those operated by independent ATM deployers (convenience store ATMs, etc.).

In September 2024, the CFIP signed an MOU with the KFTC and Samsung Electronics to

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12) The new criterion requires a savings bank's equity capital to be equal to at least 7% of its risk-weighted assets, as defined in the "Supervisory Regulation on Savings Banks." Financial solvency standards for other types of institutions, including the National Credit Union Federation of Korea (equity capital equal to at least 5% of risk-weighted assets as defined in the "Supervisory Regulation on Mutual Finance Businesses"), the National Agricultural Cooperative Federation and the National Forestry Cooperative Federation (reserves after loss coverage equal to at least 2% of risk-weighted assets as defined in the "Supervisory Regulation on Mutual Finance Businesses"), and the Korea Federation of Community Credit Cooperatives (equity capital equal to at least 5% of risk-weighted assets as defined in the "Supervisory Regulation on Community Credit Cooperatives"), which were not previously incorporated into the regulations, are now reflected in "Sub-Regulation on the Operation and Management of the Payment and Settlement Systems."

13) Although attempts to leverage AI in the oversight of payment and settlement systems have already been made by the Bank of Canada and the BIS, this is still a new research field globally. To help guide its own AI research, the BOK broadly draws on international studies on relevant topics.

14) Mobile cash cards were introduced in June 2020 in order to respond to the mobile transition of financial services, to lower cost burdens for merchants associated with credit card processing fees, and to balance growth of the payment market that had been dominated by credit cards and other high-cost payment instruments. Currently, mobile cash cards can be used for CD/ATM transactions, payments for goods and services (debit payments), and for depositing change at participating stores into a customer's bank account.

facilitate interlinking the mobile cash card with Samsung Wallet.[15] In April 2025, cross-platform services were enabled between the mobile cash card and Samsung Wallet. This has enabled mobile cash card users to access the service not only through the moblie cash card app but also via Samsung Wallet, while allowing Samsung Wallet users to tap into a wider network of supported financial institutions[16] for cardless ATM access.

In December 2024, for greater convenience and usability of CD/ATMs for persons with disabilities, the "CD/ATM Standards for Users with Special Needs" was revised[17] to include new regulatory requirements, including for an audio alert system to warn users when a card is inserted the wrong way and for a special flooring material in the access area in front of a machine.

ATMs are critical infrastructure that play a vital role in ensuring the public's access to cash. The BOK, together with relevant institutions and related industries, will work toward the medium- to long-term goal of achieving balanced distribution of ATMs across the country.

[Oversight of Payment and Settlement Systems and Innovation Efforts]

5 The BOK continued robust oversight of payment and settlement systems, conducting assessments of key payment and settlement systems and joint examinations of financial companies.

In 2024, the BOK completed its regular assessment of the central counterparty (CCP)[18] for exchange-traded securities and exchange-traded and OTC derivatives, operated by the KRX, based on international standards, including the Principles for Financial Market Infrastructures (PFMI) and the Guidance on Cyber Resilience for Financial Market Infrastructures.

The assessment found that the KRX broadly observes the PFMI, though it needed some improvement in certain areas, such as in the management of liquidity risk and operational risk. The KRX plans to address these findings and improve the identified areas.

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15) The mobile cash card service integration initiative is open to all domestic and foreign-affiliated payment service providers. The final decision on the approval of a new provider interested in offering mobile cash card-linked services will be made in consultation with the KFTC, the program operator, and member banks.

16) Samsung Wallet is currently partnered with 10 financial institutions to provide cardless ATM access, while the mobile cash card is supported by 17 financial institutions.

17) This revision reflects the recent amendments to the Act on the Prohibition of Discrimination against Persons with Disabilities and Remedy against Infringement of Their Rights (amended July 27, 2021 and entered into force January 28, 2023) and the act's Enforcement Decree (entered into force March 30, 2023) aimed at facilitating kiosk access for persons with disabilities.

18) A CCP, also known as a central counterparty clearing house, guarantees the financial performance of a transaction by acting as the counterparty to both sides of the transaction. Because of this, a CCP takes on liquidity and credit risks associated with the trading activities of its members. When counterparty risk is actualized, a CCP covers resulting losses using pre-funded resources, such as member margins, joint compensation funds, and its own capital reserves. If losses incurred exceed available financial resources, a CCP may request additional joint compensation funds from clearing members, return some of its profits, or increase the capital reserves for the coverage of settlement losses in an attempt to avoid bankruptcy and prevent a member's default from spiraling into a systemic risk.

Regular assessments of payment and settlement systems in 2024

Systems subject to assessment	Recommendations for improvement
<KRX> KOSPI market settlement system KOSDAQ market settlement system Derivatives market settlement system	· Use of separate scenarios for credit and liquidity stress testing · Disclosure of the results of the margin sensitivity analysis to clearing members · Development of response procedures for general business risk and third-party risk

Source: Bank of Korea.

The regular assessment of the securities settlement system operated by the KSD is currently in progress and is expected to be completed in the second half of 2025.

The BOK and the FSS jointly examined three banks and two financial investment companies. These examinations, focused on management of intraday liquidity and settlement risk, resulted in recommendations for improvement in areas, including external reporting mechanisms for technical incidents, procedures for managing settlement risk, and liquidity crisis procedures.

To prevent the disruption of normal operations of BOK-Wire+ caused by disasters or damage, the BOK is continuously updating and improving the "BOK-Wire+ Business Continuity Plan." To improve the emergency response capabilities of payment and settlement staff of the BOK and participating institutions, the BOK regularly conducts drills using a variety of damage scenarios.

In 2024, in response to the increasing interdependencies between payment systems due to continued technological advancement and increasing sophistication of cyberattacks, the BOK updated the process for the verification of transaction data consistency between BOK-Wire+ participants to quickly resume businesses when system failures make failover to a recovery site necessary.

6 The BOK continued to implement an RTGS-based fast payment system and to adopt ISO 20022.

To eliminate credit risk inherent in deferred net settlement (DNS)-based fast payment systems,[19] to promote financial stability by reducing collateral burdens on participants, and to align with the paradigm shift in the international community toward RTGS of retail payments,[20] the BOK has initiated a project to implement an RTGS-based fast payment system.

To this end, case studies were conducted on RTGS-based fast payment systems of major countries. Based on the insights emerging from these studies and the input of relevant institutions, financial institutions, and academics and researchers, the BOK will determine the best approach to the implementation of an RTGS-

19) A fast payment system is a system where payment orders are originated and cleared in real time. Fast payment systems are typically available around the clock, every day of the year. Several such systems are in service in Korea, including the Electronic Banking System (2001), the CD/ATM System (2004), and the Open Banking System (2016), all of which are DNS-based systems where the settlement of interbank obligations occurs on a deferred basis in the form of net settlement.

20) The BIS has noted that a paradigm shift is underway in fast payment systems worldwide where RTGS is becoming the preferred settlement arrangement. For further information, see "Developments in Retail Fast Payments and Implications for RTGS Systems" (BIS, December 2021).

based fast payment system. To begin with, the BOK will actively explore various ways of supporting private sector-driven innovation in payment and settlement systems by, for instance, adopting an open and flexible access regime that will allow tiered participation by non-bank financial institutions. Meanwhile, as the new system will increase burdens associated with the management of settlement liquidity for participants, the BOK will look into mechanisms to ease liquidity strains, including those that supply intraday liquidity to direct participants. Finally, the BOK will consider leveraging the latest technologies, such as Application Programming Interface (API), cloud computing, and in-memory and distributed computing.[21)]

Many major economies have already implemented ISO 20022 or are in the process of doing so in their payment and settlement infrastructures as a way to implement the “enhancing cross-border payments” initiative, which was set as a priority for the G20 Finance Ministers and Central Bank Governors Meeting.

For the adoption of the ISO 20022 framework in BOK-Wire+, the BOK began by developing ISO 20022 Messages.[22)] In 2024, in total, 29 messages were developed, along with an implementation guide for BOK-Wire+ participants. In October 2024, the BOK initiated the system integration process in preparation for updating its internal systems. During 2025, the BOK will proceed to update its internal systems and participants will begin system development activities in response. Tests will also be conducted in 2025 to verify the interconnection between BOK-Wire+ and participants’ systems, and to ensure the functionality of the newly developed messages. Provided that all preparatory steps, including the final test, are completed on time, the new ISO 20022-based BOK-Wire+ will launch in the second quarter of 2026.

7 The BOK actively contributed to global dialogues for the enhancement of cross-border payments.

In 2024, the Bank for International Settlements (BIS) Committee on Payments and Market Infrastructures (CPMI) and the Financial Stability Board (FSB) held in-depth discussions of central banks around the world on measures to enhance cross-border payments. Based on the outcomes of these discussions, the BIS CPMI also published a joint report with the FSB on the progress of the G20 Roadmap.

At the SWIFT International Banking Operations Seminar (SIBOS), hosted by SWIFT, the BOK took an active part in roundtable sessions, sharing Korea’s progress in adopting ISO 20022. As part of an ongoing effort to strengthen information sharing with regional central banks

21) API is a set of protocols that enables communication and exchange of data between different applications, thereby improving data access and usability. Cloud computing is a technology that delivers IT services using virtualized resources. In-memory computing is a software architecture that allows data to be kept in memory rather than traditional disk storage. Distributed computing refers to a technology in which computational tasks are executed by dividing them into multiple segments and distributing them across several nodes or servers.

22) Financial messages are structured messages that adhere to specific formats and standards and that communicate information needed to complete a financial transaction, such as the date and value of a transaction and information about financial institutions.

in Asia-Pacific region, the BOK also took part in the Executives' Meeting of East Asia Pacific Central Banks (EMEAP) Working Group on Payments and Market Infrastructures (WGPMI) and provided information to other regional central banks on the current domestic debate on virtual asset regulation.

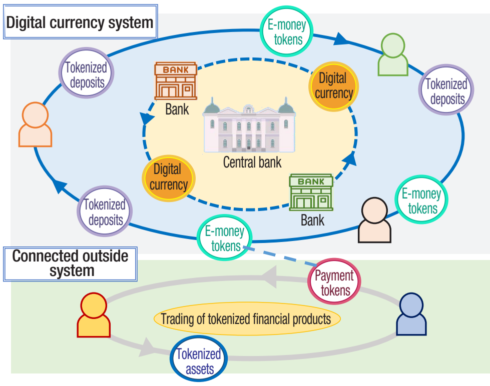
Looking ahead, the BOK will further strengthen cooperation with international organizations and major central banks and will continue to actively engage in global dialogues. In 2025, the BOK plans to take the lead in fostering cooperation among regional central banks, notably, by hosting the EMEAP WGPMI in Seoul.

[Analysis of Key Payment and Settlement Issues]

8 The BOK carried out Project Hangang and other projects to enhance cross-border payments, and conducted research into privacy-enhancing technologies.

In 2024, the BOK took an essential step in its "Project Hangang"[23] by developing a digital currency system based on digital currency to support various forms of private digital currencies, such as tokenized deposits. The BOK has also been preparing for a pilot that will allow the general public to participate and use tokenized deposits in convenience stores, large retail outlets, bookstores, coffee shops, and delivery apps. A real-world experiment is scheduled to take place from April to the end of June 2025. Prior to the launch, a thorough joint review of user protection measures, including personal data protection and cybersecurity, is conducted in cooperation with relevent authorities, such as the FSC and the FSS.

Digital currency system diagram (tentative)[1)]

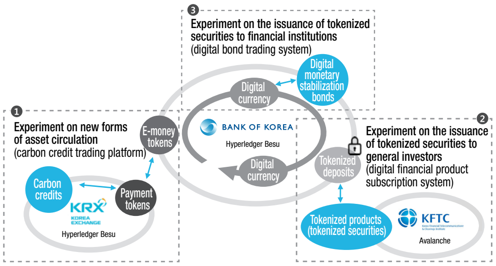


Note: 1) A system built around a digital currency issued by a central bank, where a variety of private digital currencies, including tokenized deposits issued by banks, e-money tokens which can also be issued by non-bank institutions, and payment tokens issued by connected outside system all circulate side by side.
Source: Bank of Korea.

During the fourth quarter of 2024, technical experiments were conducted in collaboration with the KRX and the KFTC to assess whether the digital currency system could support the trading of tokenized carbon credits and the issuance of tokenized securities to general investors and financial institutions. This confirmed that the digital currency system could support efficient and safe transactions of digital assets by connecting with outside distributed ledgers.

23) For further information, see the press release "BOK, FSC, and FSS, in Cooperation with the BIS, Have Launched a Project to Explore a Future Monetary System for Korea" (BOK, FSC, and FSS, October 2023).

Three technical experiments based on the digital currency system



Source: Bank of Korea.

The BOK has participated in several joint projects with international organizations to enhance cross-border payment services using digital currency technology. In April 2024, the BOK announced its participation in Project Agorá, which is conducted jointly with the BIS, the Institute of International Finance (IIF), and other major central banks, and which aims to increase the speed and transparency of cross-border payment services and to lower costs through the use of tokenized central bank money and commercial bank deposits. In October 2024, Project Mandala, jointly carried out with the BIS Innovation Hub Centre in Singapore and four central banks (Korea, Australia, Malaysia, and Singapore), drew to a successful conclusion and the final project report was submitted. The goal of Project Mandala was to reduce burdens associated with regulatory compliance checks for financial institutions in cross-border payment services.

The BOK also conducted research into technologies with the potential to enhance protection of personal data associated with digital currencies over the medium- to long-term horizon and held seminars to share the findings with experts from academia, industry, and research institutions.

9 The BOK continued to implement the G20 Roadmap for Enhancing Cross-Border Payments.

Traditional cross-border payment services, provided through correspondent banking networks, have long faced inefficiencies, such as slow processing speeds, high costs, limited access, and low transparency. In February 2020, during the G20 Finance Ministers and Central Bank Governors Meeting, "enhancing cross-border payments" was set as a priority and in October 2020, the BIS and the FSB formed an international task force and unveiled a comprehensive roadmap ("G20 Roadmap"). In this regard, the BIS CPMI selected the interlinking of national payment systems, the adoption of ISO 20022, and the extension of payment system operating hours as priority actions due to their potential to rapidly reduce costs and to improve the speed of cross-border payments in the short term.

Direct interlinking of national payment systems can improve the efficiency and speed of payment services by reducing the involvement of correspondent banks. Once ISO 20022 is implemented in SWIFT messages, this is expected to drive up the efficiency of data processing in international financial transactions. If the operating hours of major payment and settlement systems across countries are extended to expand overlapping time windows, the processing speed of cross-border payments will likely be enhanced.

In June 2023, the BOK formed the "Task Force for the Enhancement of Cross-Border Payments"[24] to track domestic progress on the implementation of the G20 Roadmap and to identify areas that need improvement. The work of this task force so far has indicated that funds transfers by individuals and businesses are generally proceeding smoothly.

The BOK will continue to monitor progress on the implementation of the G20 Roadmap in Korea in order to increase the safety and convenience of payment services available to the public.

10 The rapid expansion of domestic virtual asset markets fuelled active debates on establishing a regulatory framework.

In 2024, the domestic virtual asset market experienced massive growth, with its total capitalization surging past KRW 100 trillion, as the approval of spot virtual asset exchange-traded funds (ETFs) in major countries and the entry into force of Markets in Crypto-Assets (MiCA) in the EU reduced regulatory uncertainties and instilled hopes for a more crypto-friendly investment environment. Both asset prices and trading volumes rose dramatically in domestic trading platforms for virtual asset markets, bolstered by the U.S. election victory of a candidate who has expressed a pro-crypto stance.

In view of the rapid expansion of virtual asset markets, the Act on the Protection of Virtual Asset Users, which provides mainly for the protection of investors' assets and the prohibition of unfair or deceptive practices, was enacted and entered into force on July 19, 2024. This act imposes a series of duties and obligations upon virtual asset service providers, requiring them to take reasonable steps to protect investors' assets. Although this is widely considered to have set basic safety guardrails, there have been increasing calls for a more comprehensive regulatory framework for the virtual asset industry. In November 2024, the FSC established the "Virtual Asset Committee" to advise on policies and institutional matters related to the virtual asset market and virtual asset service providers. Centered around this committee, discussions began on the second phase of legislation for the Act on the Protection of Virtual Asset Users.[25)]The regulation of market entry and operations of virtual asset service providers, their classification into subtypes, the establishment of transparent listing and disclosure rules, and the creation of a regulatory framework for stablecoins are expected to be the key focus areas in the second legislative phase.

As part of a broader effort to build a suitable and thriving payment and settlement ecosystem for the digital finance environment, the BOK plans to take an active part in future discussions

24) This task force, led by the BOK, is a public-private consultative body composed of domestic banks, fintech money transfer service providers, and card companies. It was created to examine business processes, transaction speeds, and cost structures of domestic payment service providers in relation to the implementation of the G20 Roadmap, and to collect feedback from the industry.

25) In the wake of a succession of incidents that severely undermined confidence in virtual asset markets and resulted in heavy losses for investors, such as the Terra-Luna crash in May 2022 and the bankruptcy of the U.S. crypto exchange FTX in November 2022, Korea adopted a phased legislative approach in which the minimum regulations necessary to protect virtual asset investors would be first put in place and then other regulations would be gradually added later. At the time of the enactment of the Act on the Protection of Virtual Asset Users, the National Assembly had issued a supplementary opinion stating that the creation of a comprehensive regulatory framework, which would provide for conflicts of interest in the issuance and distribution of virtual assets, regulate stablecoins, and set forth rules for valuation, advisories, and disclosures, would be left to the next legislative session.

concerning the regulation of stablecoins, which have the potential to evolve into digital payment instruments, and provide its input about the best regulatory approaches, while moving forward and expanding its digital currency test project.

11 The government worked on regulatory improvements in the wake of the TMON-WeMakePrice event.

In July 2024, TMON and WeMakePrice, two e-commerce companies (online marketplace platforms), also acting as PGs,[26] failed to make payments to vendors. Although this event had no direct effect on payment and settlement systems,[27] it resulted in substantial fallout on consumers and small businesses and impacted primary PGs, credit card companies, and easy payment service providers in the payment chain through massive payment cancellations and refunds. Its widespread repercussions sparked debates on regulatory improvement, particularly concerning PGs.

In the wake of the TMON-WeMakePrice event, the government worked on regulatory improvements for e-commerce platforms and PGs. To address the current lack of a mechanism to protect vendors' funds, amendments will be made to the Act on Fair Transactions in Large Retail Business and the Electronic Financial Transactions Act. The government is currently working toward the amendment of these two laws to make it mandatory for e-commerce platforms (Act on Fair Transactions in Large Retail Business) and PGs (Electronic Financial Transactions Act) to segregate sales proceeds from their own funds. In tandem, the government will require e-commerce platforms to pay vendors within 20 days from the date of a sale and PGs to complete payments by the due date negotiated with merchants. Regarding gift cards, an amendment was made to the Electronic Financial Transactions Act, which entered into force on September 15, 2024, to require issuers of mobile gift cards to segregate user deposits from their own funds.[28]

26) A PG is a platform that acts as an intermediary in electronic financial transactions. It facilitates the acceptance of online payments either by collecting and transmitting customers' payment information or by processing payments on their behalf. PGs can be divided into two types according to their role in the payment flow: primary PGs (receipt of funds from credit card companies → transmission of funds to a secondary PG) and secondary PGs (receipt of funds from a primary PG → disbursement of funds to vendors).

27) For a detailed discussion on this topic, see "Box IV-3. Payment Gateway Architecture and Relationship to Payment and Settlement Systems."

28) The definition and criteria of prepaid electronic payment instrument providers were deleted and paper gift certificates that were converted to mobile gift cards were newly included in regulated product categories. However, this amendment leaves out many important safeguards with respect to paper gift certificates. The amended law does not impose a statutory limit on the size of issuance, with payment of stamp duties being the only requirement, or require a mechanism to protect user deposits.

Issues brought to light by the TMON-WeMake-Price event and government responses

Challenges	Recommendations for improvement
① **Lack of a mechanism to protect sales proceeds:** no regulations requiring the separation of vendor funds from a company's own funds	① **Separate management of sales proceeds:** e-commerce platforms (50%), PGs (100%)
② **Insufficient regulations regarding due dates for payments to vendors:** existing regulations apply only to large brick-and-mortar retailers	② **Statutory due date for payments to e-commerce vendors:** within 20 days after purchase confirmation
③ **Absence of supervisory tools for PGs:** large numbers of PGs failing to meet supervisory standards	③ **Creation of a legal basis for penalizing non-compliance:** a broader set of supervisory tools including enforcement actions according to the severity of non-compliance
④ **Regulatory vacuum concerning gift cards:** no restrictions on issuers or issuance sizes, no protective mechanism for user deposits	④ **Entry into force of the amended Electronic Financial Transactions Act:** inclusion of mobile gift cards among regulated products

Source: Bank of Korea.

The TMON-WeMakePrice event is a case where two e-commerce platforms, which also acted as PGs, attempted to make up for losses in their e-commerce businesses using sales proceeds they managed in their capacities as PGs. This highlights risks involved in blending several business models or operating across several different markets. Continuous regulatory improvement is needed as the internal retention of sales proceeds by e-commerce platforms can also occur in delivery and hotel booking service businesses. To contribute to this effort, the BOK plans to strengthen monitoring and analysis of electronic financial service providers that issue prepaid payment instruments and PGs by making use of its right to request submission of data from them.

I

Payment and Settlement Trends and Settlement Risk Management

1. Large-Value Payment System

Settlement Trends

Korean Won Funds

In 2024, large-value KRW funds transferred through BOK-Wire+, which provides final settlement between financial institutions, jumped 11.2% in daily average value compared to the previous year to KRW 617.0 trillion, mainly due to the increase in securities settlement funds (Table I-1).[29)]

Table I-1. Settlement value in BOK-Wire+ by type (daily average)

(KRW trillion, %)

	2022	2023	2024	% change
Total KRW funds transfers	524.3	554.6	617.0	11.2
Transfers between participants	497.3	533.3	601.1	12.7
Call transaction funds	23.1	28.0	28.8	2.7
Securities settlement funds	269.9	301.2	357.2	18.6
Foreign exchange settlement Funds	16.8	19.2	19.5	1.8
Customer payments[1)]	79.5	79.2	83.7	5.7
Net settlement funds[2)]	27.5	27.0	28.4	5.4
Others[3)]	80.6	78.8	83.5	6.0
Transfers between participants and BOK[4)]	27.1	21.3	15.9	-25.5
Total foreign currency denominated funds transfers[5)] (USD billion)	1.6	1.2	1.2	-1.2

Notes: 1) Large-value funds transfers by individuals or corporate customers, processed through BOK-Wire+.
2) Net settlement of obligations between participants arising from the retail payment systems.
3) Funds transfers between the head office and branches of financial institutions, etc.
4) Including payments on government and public bonds, payments to and from the Treasury, loans from the BOK, etc.
5) Including deposits and withdrawals.
Source: Bank of Korea.

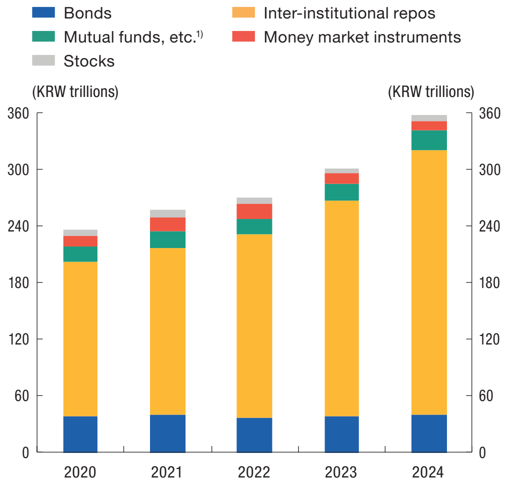
By type of funds transferred, securities settlement funds[30)] processed through the system leapt by 18.6% from 2023, buoyed by a surge in inter-institutional repo transactions.[31)] Call transaction funds climbed by 2.7% compared to the prior year (Figure I-1).

29) The daily average volume settled in BOK-Wire+ reached 25,539 during 2024, representing a 9.7% increase compared to a year earlier (23,289). As of the end of 2024, 136 financial institutions, including 52 banks and 84 non-bank financial institutions, participated in BOK-Wire+.

30) Including the value of free of payment (FoP) settlements, in addition to delivery-versus-payment (DvP) and bond redemption transactions. For bank bonds, municipal bonds, and corporate bonds, the Korea Securities Depository (KSD) submits redemption certificates of all bonds maturing on the same clearing date to receive their principal and interest payments in a single batch. The funds are then distributed to individual investors through BOK-Wire+ and the Electronic Banking System.

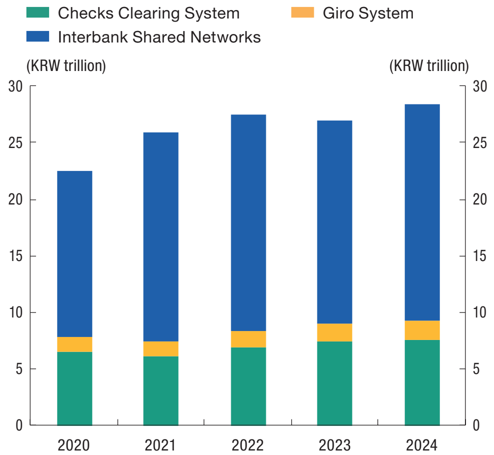
31) Since the exclusion in principle of non-bank financial institutions from the call market in accordance with "Reform Measures for the Interbank Money Market" (FSC, Ministry of Economy and Finance, FSS, and the BOK, November 2013), aimed at reducing the concentration of short-term funding transactions in the call market and fostering the development of the inter-institutional repo market, in March 2015, inter-institutional repo transactions have steadily increased.

Figure I-1. Securities transaction funds settled through BOK-Wire+ (daily average)



Note: 1) Collective investment securities under the Financial Investment Services and Capital Markets Act.
Source: Bank of Korea.

Figure I-2. Net settlement funds transferred through BOK-Wire+ (daily average)



Source: Bank of Korea.

The value of KRW funds settlements associated with foreign exchange transactions[32] edged up by 1.8%, with a modest increase in both general funds transfers through the interbank correspondent network and settlements through the CLS system (Table I-1).

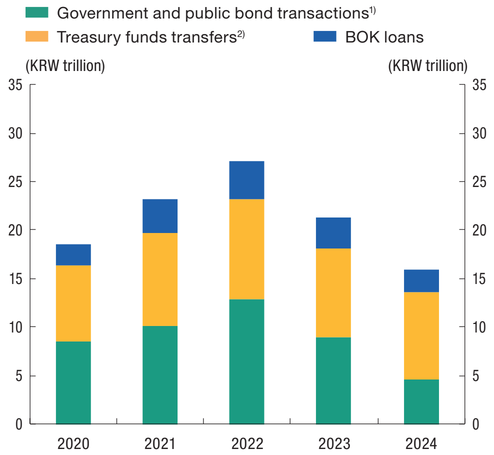
The value of net settlements between BOK-Wire+ participants grew by 5.4% from the previous year to KRW 28.4 trillion, largely due to increased payment activity in the Interbank Shared Networks, including internet banking (Figure I-2).

Meanwhile, the daily average value of settlements made between BOK-Wire+ participants and the BOK for government and public bonds transactions conducted through the BOK's securities system, payments to and from the Treasury, and BOK loans fell 25.5% from the prior year to KRW 15.9 trillion, mainly due to the decrease in government and public bonds transactions (Table I-1, Figure I-3).[33]

32) This refers to all KRW funds transfers processed through BOK-Wire+ for the settlement of foreign exchange transactions, including both general funds transfers through the interbank correspondent network and PvP settlements processed by the CLS system.

33) This was mainly due to the sharp drop (-27.5%) in issues and redemptions of monetary stabilization bonds, caused by the reduced need for liquidity adjustments, as well as by the sunsetting of the BOK Bank-Intermediated Loans (up to KRW 13 trillion) for financial support to SMEs affected by COVID-19 on November 30, 2023.

Figure I-3. Funds transferred between participants and the BOK (daily average)



Notes: 1) Issues and redemptions of government bonds and monetary stabilization bonds, sales and purchases of repos (including repurchases).
2) Including only transactions that are processed through BOK-Wire+ (investment and redemptions of surplus funds, national tax payments, etc.).
Source: Bank of Korea.

Foreign Currency Funds

The BOK opens foreign currency-denominated deposit accounts for financial institutions to help them meet their foreign currency reserve requirements and provides them with transfer, deposit, and withdrawal services for currencies including the USD and the JPY. In 2024, the daily average value of foreign currency funds transfers (including deposits and withdrawals) slid by 1.2% compared to the prior year to USD 1.2 billion amid the decline in foreign currency deposits by residents[34)](Table I-1, Table I-2).

Table I-2. Foreign currency funds transferred through BOK-Wire+ (daily average)

(USD million, %)

	2021	2022	2023	2024	% change
Transfers	0.2	0.2	0.2	0.2	-8.7
Deposits	568.4	823.7	583.3	593.1	1.7
Withdrawals	559.5	812.8	626.9	601.9	-4.0
Total	1,128.1	1,636.6	1,210.4	1,195.2	-1.2

Source: Bank of Korea.

Supply of Intraday Liquidity

To assist BOK-Wire+ participants with their settlement liquidity management, the BOK offers facilities such as intraday overdrafts and intraday repos that are designed to address temporary liquidity needs. In 2024, the daily average value of intraday liquidity supplied to participants jumped 29.2% from a year earlier to KRW 4.3190 trillion (Table I-3).

Table I-3. Supply of intraday liquidity (daily average)

(KRW billion, %)

	2022	2023	2024	% change
Intraday overdrafts[1)]	881.1	841.9	1,278.1	51.8
Intraday repos	2,143.6	2,501.0	3,040.9	21.6
Total	3,024.7	3,342.9	4,319.0	29.2

Note: 1) Based on net intraday overdraft balance (gross balance less current account balance).
Source: Bank of Korea.

Intraday Overdrafts

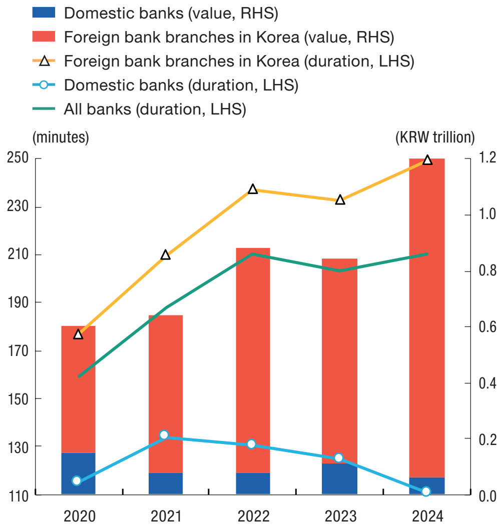
An intraday overdraft is a facility providing short-term liquidity to banks experiencing a temporary liquidity shortfall, in the form of a

34) At the end of 2024, the outstanding balance of residents' foreign currency deposits stood at USD 101.30 billion, a 2.5% drop from a year earlier (USD 103.88 billion).

daylight loan. Its goal is to ensure a smooth flow of payments between BOK-Wire+ participants. In 2024, the daily average value of intraday overdrafts incurred by participant banks increased massively by 51.8% from a year ago to KRW 1.2781 trillion. By type of bank, while this value sharply fell by 43.3% for domestic banks (KRW 62.9 billion), it surged by 66.2% for foreign bank branches in Korea (KRW 1.2153 trillion).[35)]

The daily average duration of outstanding intraday overdrafts rose by seven minutes compared to the prior year to 211 minutes. By type of bank, this duration was curtailed by 14 minutes for domestic banks (111 minutes), while it was extended by 17 minutes for foreign bank branches (250 minutes) during the same period (Figure I-4).

Figure I-4. Value[1)] and duration[2)] of intraday overdrafts (daily average)



Notes: 1) Based on net intraday overdraft balance (gross balance less current account balance).
2) Based on the cumulative durations of each participant (e.g., if a participant has an intraday overdraft position between 11:00 and 12:00 and, then, between 14:00 and 15:00, the cumulative duration for this participant would be 120 minutes).

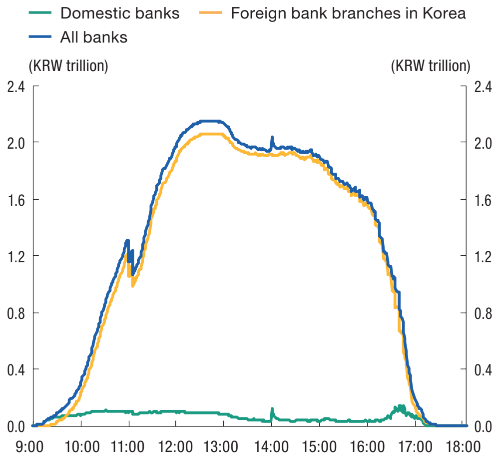
Source: Bank of Korea.

The intraday overdraft balance rapidly increased during morning hours, driven by foreign bank branches in Korea. After reaching a peak at 12:36 (KRW 2.1507 trillion), it decreased precipitously from around 16:00 and was fully repaid by the closing time of BOK-Wire+. The average daily high (KRW 2.1507

35) The spike in the use of intraday overdrafts by foreign bank branches in Korea is primarily explained by the increase in inter-institutional repo trading. Issuing call loans to domestic banks has been a significant part of foreign bank branches' business model. However, demand for call loans has recently declined following the hike in the minimum regulatory liquidity coverage ratio (LCR). This has prompted foreign bank branches in Korea to steadily increase their repo purchases. In 2024, the daily average aggregate value of inter-institutional repo transactions climbed by 23.1% compared to 2023 to KRW 274.8 trillion, with the daily average value of repo purchases by foreign bank branches rising from KRW 3.1 trillion to KRW 4.9 trillion during the same period. The concomitant upswing in foreign bank branches' intraday overdraft activity suggests that their settlement liquidity fell short of financing needs arising from increased repo purchases and that some of the repo purchases were funded through intraday overdrafts. Meanwhile, the intraday overdraft balance of domestic banks dipped despite increased repo purchases (KRW 126.7 trillion in 2023 → KRW 159.0 trillion in 2024) as their liquidity conditions were improved by lower market interest rates.

trillion) in 2024 exceeded that in 2023 (KRW 1.3214 trillion) by 62.8% (Figure I-5).[36]

Figure I-5. Intraday overdraft balance[1] (daily average)



Note: 1) Net intraday overdraft balance (gross balance less current account balance) per minute.
Source: Bank of Korea.

Intraday Repos

The BOK uses intraday repo operations to provide short-term liquidity to the Korea Exchange (KRX) and to financial investment companies. The purpose of intraday repo operations is to encourage BOK-Wire+ participants to complete security trade-related funds settlement through BOK-Wire+ earlier in the business day and to reduce the concentration of settlement activity toward the system closing time. In 2024, the daily average value of liquidity supplied through intraday repo operations increased by 21.6% to KRW 3.0409 trillion from the prior year due to an increased demand for short-term funding driven by a rise in short-term investment including institutional repo transactions[37] (Table I-4).

Table I-4. Settlement liquidity supplied through intraday repos (daily average)

(KRW billion, %)

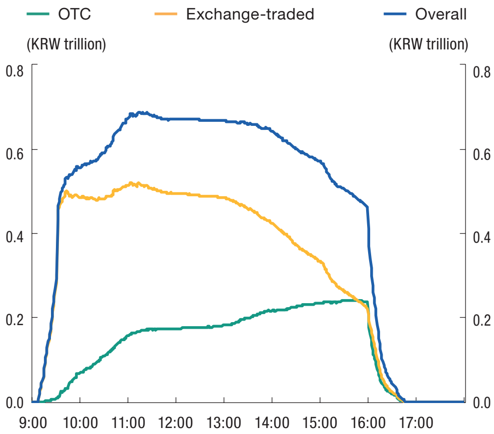
	2023			2024			% change
	Exchange traded	OTC	Total	Exchange traded	OTC	Total	
KRX[1]	1,790.0	-	1,790.0	1,983.2	-	1,983.2	10.8
Financial investment companies	310.3	400.6	711.0	420.1	637.6	1,057.7	48.8
Total	2,100.4	400.6	2,501.0	2,403.3	637.6	3,040.9	21.6

Note: 1) The KRX, the central counterparty (CCP) for the government bond market (exchange-traded government bonds), has been designated as a counterparty to the BOK's intraday repo operations.
Source: Bank of Korea.

The outstanding intraday repo balance rose sharply during morning hours, as more than half of all transactions in the exchange-traded bond market are settled customarily before noon. After hitting a daily high balance (KRW 688.6 billion) at 11:12, it rapidly declined from around 16:00 and was fully repaid by the system closing time. This year's average daily high exceeded the previous year's high (KRW 545.2 billion) by 26.3% (Figure I-6).[38]

36) Amid the increase in value of intraday overdrafts, the average daily high also rose.
37) In 2024, the daily average value of institutional repo transactions by financial investment companies, which are counterparties to the BOK's intraday repo operations, increased by 16.0% compared to the previous year (KRW 64.3 trillion) to KRW 74.6 trillion.
38) The average daily high in the intraday repo balance climbed to a new level amid the rising use of intraday repos.

Figure I-6. Intraday repo balance[1] (daily average)



Note: 1) Net supply per minute (intraday cumulative supply less intraday cumulative repayments).
Source: Bank of Korea.

Risk Management Status

The proportion of payment orders in the queue for settlement[39] and the maximum intraday overdraft cap utilization rate,[40] the two main indicators of BOK-Wire+ participants' settlement liquidity, suggest that settlement liquidity by its participants was appropriately managed in 2024. The proportion of payment orders in the queue for settlement stood at 5.0%, similar to the prior year (4.9%),[41] while the maximum intraday overdraft cap utilization rate edged up slightly during the same period from 20.9% to 22.7% (Table I-5).[42]

Table I-5. Maximum intraday overdraft cap utilization rate and proportion of payment orders in the queue for settlement (based on value)

(%)

	2020	2021	2022	2023	2024
Maximum intraday overdraft cap utilization rate[1]	23.5	20.3	23.0	20.9	22.7
Proportion of payment orders in the queue for settlement[2]	3.3	3.7	4.1	4.9	5.0

Notes: 1) Average ratio of the daily maximum utilization of net intraday overdrafts out of the intraday overdraft cap (only for banks).
2) Total value of payments in the queue relative to gross settlement value (excluding payments processed through multilateral netting for liquidity savings).
Source: Bank of Korea.

The proportion of payment orders (based on value) settled after 16:00, toward the closing time of BOK-Wire+, amounted to 52.7%, roughly unchanged from 2023 (52.8%) (Figure I-7).

In 2024, the frequency of extending BOK-Wire+'s operating hours was the same as that in the prior year (12 times). As operating hours

39) When a BOK-Wire+ participant has an insufficient current account balance, payment orders submitted by this participant are held pending in the queue file and are cleared only when sufficient funds have accumulated through incoming payments. The proportion of payment orders in the queue is the proportion of payment orders that were temporarily placed in the queue due to insufficient funds in a participant's current account and eventually cleared among the total value of settlements processed through BOK-Wire+.

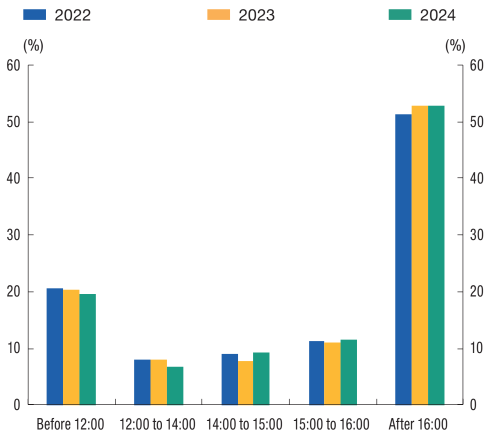
40) This is the ratio of maximum utilization out of the intraday overdraft cap. An intraday overdraft is automatically executed when a participant submits a payment or settlement order in excess of the current account balance. The amount of an intraday overdraft is limited to the value of eligible collateral pledged by the participant to the BOK.

41) Most payment orders in the queue are those initiated by financial investment companies. As no reserve requirements exist for these companies, they do not maintain sufficient account balance at all times. Because of this, a rise in the value of settlements based on inter-institutional repo transactions tends to drive up the value of payment orders in the queue.

42) This was caused mainly by the increase in intraday overdrafts incurred by the foreign bank branches in Korea.

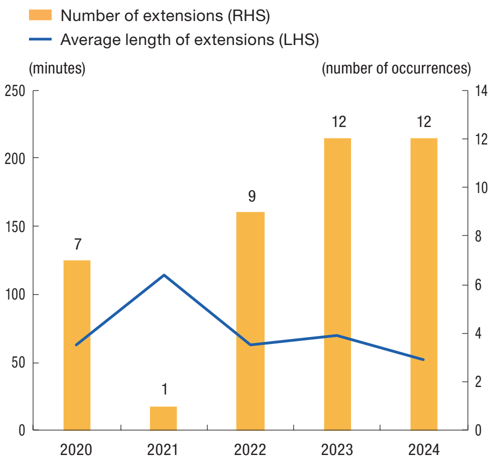
were extended mostly for reasons such as temporary technical difficulties and the BOK's open market operations, which required additional processing time, they had negligible impacts on the overall payment and settlement system. Admonitions were issued to participants responsible for IT system incidents that caused the extension of BOK-Wire+'s operating hours, along with recommendations to develop a plan to prevent any recurrence of similar incidents. Continuous efforts will be made to appropriately manage risks related to extended-hours operations (Figure I-8).

Figure I-7. Proportion of settlements through BOK-Wire+ by time slot[1)](based on value)



Note:1) Value settled in each time period relative to gross settlement value.
Source: Bank of Korea.

Figure I-8. Extension of BOK-Wire+ operating hours



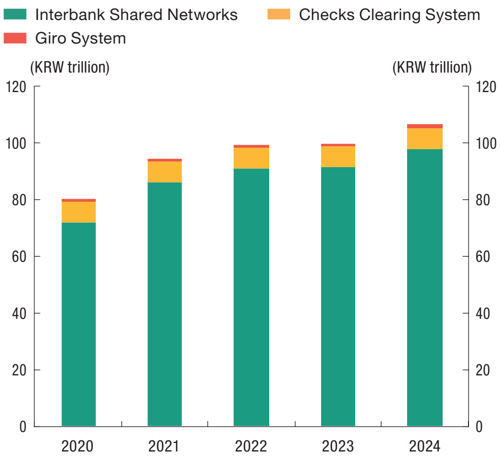
Source: Bank of Korea.

2. Retail Payment Systems[43)]

Payment Trends

In 2024, the daily average volume and value of payments processed through the retail payment systems[44)] operated by the Korea Financial Telecommunications and Clearings Institute (KFTC) increased by 10.5% and 6.4%, respectively, from the prior year to 44.05 million transactions and KRW 106.4 trillion (Table I-6, Figure I-9).[45)]

Figure I-9. Value of payments made through the retail payment systems operated by the KFTC (daily average)



Source: Bank of Korea.

Table I-6. Payments processed through the KFTC Interbank Shared Networks, Checks Clearing System, Giro System (daily average)

(thousands of transactions, KRW billion, %)

		2022	2023	2024	% change
Volume	Interbank Shared Networks	31,971	35,714	39,698	11.2
	(Electronic Banking System)	21,333	23,938	26,362	10.1
	(Interbank Funds Transfer System)	238	231	222	-3.7
	(Open Banking System)	5,234	6,310	7,740	22.6
	(CD/ATM System)	967	892	821	-8.0
	Checks Clearing System	154	114	84	-25.9
	(Cashier's checks)	150	110	80	-26.6
	(Promissory notes and others[1)])	3	3	3	-9.5
	Giro System	4,104	4,050	4,269	5.4
	(Credit transfers)	601	560	765	36.6
	(Direct debits)	3,093	3,062	3,062	0.0
	(Direct credit transfers)	380	401	420	4.6
	Total	36,230	39,878	44,051	10.5
Value	Interbank Shared Networks	90,765	91,602	97,971	7.0
	(Electronic Banking System)	83,473	84,283	90,383	7.2
	(Interbank Funds Transfer System)	4,885	4,622	4,611	-0.2
	(Open Banking System)	1,364	1,709	2,034	19.0
	(CD/ATM System)	584	514	462	-10.0
	Checks Clearing System	7,340	7,232	7,119	-1.6
	(Cashier's checks)	961	846	672	-20.6
	(Promissory notes and others[1)])	3,678	3,198	3,126	-2.3
	Giro System	1,174	1,237	1,353	9.3
	(Credit transfers)	427	439	520	18.5
	(Direct debits)	427	450	462	2.7
	(Direct credit transfers)	314	343	365	6.6
	Total	99,279	100,071	106,443	6.4

Note: 1) Including current account checks, household checks, and bills of exchange.

Sources: Bank of Korea, KFTC.

43) While the KFTC is responsible for validating and transmitting payment instructions issued and received among retail payment system participants, and netting the resulting transactions, the BOK's role is to approve net settlement, determine the transactions that are eligible for net settlement, and operate the net settlement risk management mechanism.

44) Based on the value of payments for the Interbank Shared Networks (interbank funds transfer) and the Giro System, and based on the value cleared for the Checks Clearing System.

45) The increase in the value of payments processed through the retail payment systems reflects the upswing in funds transferred through the Electronic Banking System, mainly driven by IPO subscriptions. During IPO periods, fund inflows are mostly processed through internet banking in the Electronic Banking System, while the related refunds are generally processed through firm banking. In 2024, the boom in the IPO market caused IPO subscription deposits to sharply surge (KRW 314.2 trillion in 2023 → KRW 418.8 trillion in 2024).

The daily average volume and value of funds transferred through the Interbank Shared Networks operated by the KFTC reached 39.79 million transactions and KRW 98.0 trillion, up 11.2% and 7.0%, respectively, from a year earlier. Brisk growth continued in funds transfers through the Open Banking System in the Interbank Shared Networks, continuing the robust uptrend from the previous year (Table I-6).

The daily average volume and value of checks cleared in the Checks Clearing System declined by 25.9% and 1.6%, respectively, compared to the previous year to 80,000 transactions and KRW 7.1 trillion, as cashier's checks and promissory notes are being replaced by electronic payment instruments (Table I-6).

The daily average volume and value of funds transferred through the Giro System climbed by 5.4% and 9.3%, respectively, from a year earlier to 4.27 million transactions and KRW 1.4 trillion (Table I-6).

Risk Management Status

As funds transfers in retail payment systems are small-value and high-volume, obligations between financial institutions are offset and settled on a net basis via BOK-Wire+ at a designated time. In order to manage net settlement risk, the BOK requires participants to establish a net debit cap so that the net debit position incurred does not exceed the cap. The aggregate net debit cap of all participants stood at KRW 96.0 trillion at the end of 2024, representing a 1.1% decrease from the end of 2023 (Table I-7).

Table I-7. Net debit cap[1] by type of participant

(year-end basis, KRW trillion, %)

	2022	2023	2024	% change
Direct participants (including banks)	71.7	91.8	90.6	-1.3
Indirect Participants	4.7	5.3	5.4	2.5
Financial investment companies	2.1	2.2	2.4	5.4
Non-bank deposit-taking institutions[2]	2.5	3.0	3.0	0.3
Total	76.4	97.1	96.0	-1.1

Notes: 1) Upper limit on the net debit position (cumulative value of outgoing payment orders less incoming payment orders received from other banks) that retail payment system participants may incur.
2) The Korea Federation of Community Credit Cooperatives, the National Forestry Cooperative Federation, the Korea Federation of Savings Banks, the National Credit Union Federation of Korea, and the National Agricultural Cooperative Federation.
Source: Bank of Korea.

In 2024, the maximum net debit cap utilization rate (daily average) increased slightly from 2023 (16.1%) to 16.7%. The frequency of participants' net debit cap utilization rates exceeding the cautionary level (70%) dropped sharply from a year earlier (39 times) to 16 times (Table I-8).

Table I-8. Status of net debit cap utilization rate

(%, number of times)

	2020	2021	2022	2023	2024
Maximum net debit cap utilization rate[1]	17.6	18.3	15.9	16.1	16.7
Number of times net debit cap utilization rates exceeded the cautionary level	109	171	80	39	16

Note: 1) Average daily maximum net debit cap utilization rate of all participants.
Source: Bank of Korea.

To cover net settlement exposure, participants are required to pledge collateral to the BOK, equivalent in value to a certain percentage of their respective net debit caps (the net-settlement collateral ratio). At the end of 2024, the aggregate appraised value of collateral pledged by participants increased by KRW 7.7 trillion to KRW 89.9 trillion from KRW 82.2 trillion at the end of 2023, due primarily to the upward adjustment of the net-settlement collateral ratio (80% → 90%).[46)]

46) Effective as of August 1, 2024, the BOK raised the net-settlement collateral ratio from 80% to 90%.

3. FX Settlement System

Payment Trends

Foreign exchange transactions are settled either through the CLS system,[47] the global inter-bank correspondent network, or the domestic foreign currency clearing system. In 2024, the daily average value of payment-versus-payment (PvP) settlements through the CLS system, the only channel where the transaction data are readily available, increased by 5.9% from the prior year to USD 94.2 billion (Table I-9).

Risk Management Status

In 2024, the share of PvP settlements, which eliminate foreign exchange settlement risk arising from separate payment of each currency leg, inched down by 1.4% to 76.5% from 77.9% in 2023 (Figure I-10).

Meanwhile, the rate of KRW liquidity savings[48] for financial institutions resulting from multilateral netting used in the CLS system stood at 95.6%.

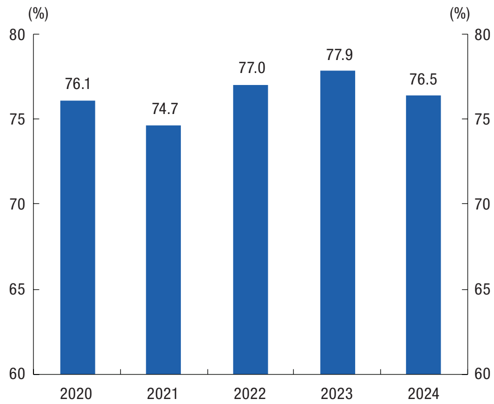
Table I-9. Value settled in the CLS system[1] (daily average)

(USD billion, %)

2021	2022	2023	2024	% change
75.3	86.5	88.9	94.2	5.9

Note: 1) Based on the aggregate value of foreign exchange spot, forward, and swap transactions reported by financial institutions (gross value before multilateral netting).
Source: Bank of Korea.

Figure I-10. Share of FX transactions settled in the CLS system[1)2)] (daily average)



Notes: 1) Share of transactions settled in the CLS relative to all CLS-eligible transactions.
2) Based on transactions by domestic banks and foreign bank branches in Korea.
Source: Bank of Korea.

47) In the CLS system, foreign exchange transactions are settled on a PvP basis during a common time window (07:00-12:00 CET). CLS-eligible transactions include spot, forward, and swap transactions. The discussion of foreign exchange settlement in this report is centered on PvP settlements through the CLS system due to the availability of accurate transaction data.

48) Liquidity savings rate (%) = [1-(net settlement value/gross settlement value)]×100 = (liquidity savings/gross settlement value)×100.

4. Securities Settlement Systems

Settlement Trends

In 2024, the daily average value of securities trades settled in the securities settlement systems operated by the KRX and the Korea Securities Depository (KSD) reached KRW 325.8 trillion, up 21.4% from a year earlier. The daily average value of settlement for trades in the exchange markets rose by 11.3% to KRW 3.7 trillion on higher trading activity in stocks and derivatives, while that of OTC transactions vaulted by 21.6% to KRW 322.1 trillion amid a sharp increase in collective investment security (34.1%), stock (28.6%), and inter-institutional repo (22.9%) transactions (Table I-10).

Table I-10. Settlement value in securities settlement systems (daily average)

(KRW billion, %)

		2022	2023	2024	% change
Exchange Traded	Stocks	682	685	887	29.5
	Bonds[1)]	2,097	2,475	2,582	4.3
	Derivatives	148	132	195	47.9
	Subtotal	2,928	3,292	3,665	11.3
OTC	Stocks[2)]	830	844	1,086	28.6
	Bonds[3)]	9,837	10,551	11,699	10.9
	Inter-institutional repos	198,072	233,102	286,554	22.9
	Money market instruments[4)]	14,633	9,420	8,074	-14.3
	Collective investment securities[5)]	10,382	10,931	14,663	34.1
	Derivatives[6)]	145	122	54	-56.2
	Subtotal	233,900	264,971	322,130	21.6
Total		236,827	268,263	325,795	21.4

Notes: 1) Settlement value of government bonds (including repos) and corporate bonds.
2) Value settled between financial investment companies and institutional investors.
3) Final settlement value after continuously netting receivables and payables in chain settlement.*
4) Final settlement value of certificates of deposit (CD), commercial paper (CP), and electronic short-term bond transactions after continuously netting receivables and payables in chain settlement.*
5) Value based on both subscription and redemption transactions.
6) Eligible IRS value settled through the KRX.
* A method in which multiple transactions between participants buying and selling the same security are settled as a series of transactions in one direction.

Sources: KRX, KSD.

Risk Management Status

During 2024, settlement risk in securities settlement systems[49)] was generally well-managed thanks in large part to the delivery-versus-payment (DvP) mechanism linked to BOK-Wire+.

49) Risk of the delivery of securities not being made against completion of the corresponding payment.

All exchange-traded stock and government bond transactions were settled before their respective penalty deadlines. In OTC markets, there was one instance in which a stock trade by an institutional investor was settled after the penalty deadline (16:50). However, the value of settlements after the penalty deadline accounted for only a small fraction of the total value settled on that day (0.01%) (Table I-11).

Table I-11. Number of securities transactions settled after deadline

(number of instances)

Type	Settlement deadline[1]	Penalty deadline[2]	2022	2023	2024
Exchange-traded stocks	16:00	16:00	0	0	0
Exchange-traded government bonds	16:00	17:00	0	0	0
OTC stock transactions by institutional investors	16:50	16:50	0	0	1

Notes: 1) Settlement deadline under the system operating rules.
2) Deadline after which penalties for late settlement are imposed.
Source: Bank of Korea.

The proportion of inter-institutional repo and OTC bond transactions settled on a DvP basis, which simultaneously delivers securities and corresponding funds so as to eliminate settlement risk, further increased, continuing the previous year's upward trend (Table I-12).

Table I-12. Proportion of DvP in OTC transactions[1)2)]

(%)

Type	2020	2021	2022	2023	2024
Inter-institutional repos	94.1	94.1	94.5	95.7	95.9
OTC bonds	90.3	90.5	93.8	97.3	97.5

Notes: 1) Proportion of total settlement value made through BOK-Wire+ (DvP).
2) OTC bonds include CDs, CP, and electronic short-term bonds (based on final settlement value after continuously netting receivables and payables in chain settlement).
Source: KSD.

Box I-1.

Trends in the Use of Non-Cash Payment Instruments

Checks and Bills

During 2024, while the use of checks and bills (daily average) fell by 22.1% in volume, the value cleared edged slightly higher by 2.7% compared to the prior year. This appears to have been due, respectively, to the declining trend in the usage of promissory notes amid the growing adoption of electronic payment instruments and the increased issuance of electronic bills by financial investment companies in connection with subscription deposit inflows for IPOs.[50)]

Checks and bills[1)] (daily average)

(thousands of transactions, KRW billion, %)

		2022	2023	2024	% change
Volume	Cashier's checks	224	166	128	-23.2
	Preset value	186	134	103	-23.2
	(KRW 100,000 notes)	114	76	55	-26.9
	Non-preset value	38	33	25	-23.3
	Promissory notes, etc.[2)]	9	9	8	-5.1
	Electronic bills	6.0	5.9	5.7	-2.6
	Others[3)]	1.6	1.6	1.5	-3.8
	Total	235	177	138	-22.1
Value	Cashier's checks	1,244	1,075	897	-16.6
	Preset value	83	65	53	-19.4
	(KRW 100,000 notes)	11	8	6	-26.9
	Non-preset value	1,161	1,010	844	-16.5
	Promissory notes, etc.[2)]	12,717	11,292	11,763	4.2
	Electronic bills	2,133	2,127	2,374	11.6
	Others[3)]	2,701	3,188	3,321	4.2
	Total	16,662	15,555	15,981	2.7

Notes: 1) Including checks and bills cleared through the Checks Clearing System and those that were directly presented at a teller window, as well as electronic bills.
2) Including promissory notes, current account checks, household checks, bills of exchange, and electronic bills.
3) Postal money orders, receipts for principal and interest payments on securities, etc.
Source: KFTC.

Account Transfers

In 2024, the daily average volume and value of account transfers between financial institutions, excluding transfers made directly via BOK-Wire+, recorded an increase of 10.7% and 7.0%, respectively, from a year earlier. Funds transfers conducted through the Electronic Banking System grew at an accelerated rate (7.2%, based

50) Financial investment companies that act as a bookrunner for an IPO are required to deposit the full amount of subscription deposits received from investors with the Korea Securities Finance Corporation (KSFC) on the subscription closing date. However, actual funds transfers from investors' banking institutions occur on the following morning, in the form of net settlement. Because of this, financial investment companies that face a temporary shortfall on the subscription closing date would often issue electronic bills equal to the shortfall to the KSFC in order to meet the deposit requirement. This is one reason why IPO subscriptions frequently coincide with an increase in the issuance of electronic bills by financial investment companies.

on value) compared to 2023 as IPOs picked up momentum.

Account transfers (daily average)

(thousands of transactions, KRW billion, %)

		2022	2023	2024	% change
Volume	Credit transfers[1]	23,707	26,434	29,119	10.2
	Electronic Banking System[2]	21,333	23,938	26,362	10.1
	(Internet banking)[3]	12,132	13,639	15,136	11.0
	(Firm banking)[4]	8,205	9,209	10,183	10.6
	Interbank Funds Transfer System	238	231	222	-3.7
	Debit transfers	11,896	12,871	14,408	11.9
	Total	35,604	39,305	43,526	10.7
Value	Credit transfers[1]	89,799	90,393	96,590	6.9
	Electronic Banking System[2]	83,473	84,283	90,383	7.2
	(Internet banking)[3]	38,293	39,521	43,585	10.3
	(Firm banking)[4]	33,793	34,163	37,467	9.7
	Interbank Funds Transfer System	4,885	4,622	4,611	-0.2
	Debit transfers	1,988	2,297	2,584	12.5
	Total	91,787	92,690	99,174	7.0

Notes: 1) Excluding transfers conducted through BOK-Wire+.
2) Based on transfers to and from external bank accounts.
3) Including mobile banking transactions.
4) Corporate financial transactions systems provided by financial institutions.
Sources: Bank of Korea, KFTC.

Payment Cards

In 2024, the daily average volume and value of payment card transactions climbed by 3.4% and 3.9%, respectively, compared to the previous year. By payment card type, the daily average volume and value of credit-based transactions grew by 3.6% and 4.1%, respectively. The daily average volume and value of debit-based transactions gained 3.3% and 3.7%, respectively, due primarily to the increase in check card[51] transactions. The rate of increase in the use of payment cards decelerated overall amid slowing growth in private consumption.[52] In the case of prepaid transactions, both the volume and value of transactions plunged by 15.5% and 28.7%, respectively, during the same period, much of which was attributable to the discontinuation of local community gift voucher programs at some card companies.

Payment card usage (daily average)[1]

(thousands of transactions, KRW billion, %)

		2022	2023	2024	% change
Volume	Credit-based (credit cards)	46,400	50,097	51,918	3.6
	Debit-based	26,488	27,925	28,838	3.3
	(Check cards)	26,271	27,648	28,532	3.2
	(Cash cards)[2]	216.9	276.8	306.5	10.7
	Prepaid (prepaid cards)	565	358	302	-15.5
	Total	73,453	78,379	81,058	3.4
Value	Credit-based (credit cards)	2,611	2,780	2,894	4.1
	Debit-based	640	670	695	3.7
	(Check cards)	637	666	690	3.6
	(Cash cards)[2]	3.3	4.5	4.9	9.8
	Prepaid (prepaid cards)	14.5	9.7	6.9	-28.7
	Total	3,266	3,460	3,596	3.9

Notes: 1) Based on card transactions by individuals and corporations conducted at accepting merchants in and outside Korea.
2) Including debit cards.
Sources: Stand-alone card companies, payment card-issuing banks, KFTC.

By method of payment, while the daily average value of device-present payments remained unchanged from a year earlier, that of device-not-present payments rose by 4.1%. Of the device-present payment method, the daily average value of payments using physical cards

51) Commonly known as a debit card internationally.

52) Change in private consumption (nominal basis): 6.4% in 2021 → 8.8% in 2022 → 5.1% in 2023 → 3.2% in 2024 (preliminary value).

began a downward trend[53] during this period, whereas the value of payments using mobile devices or computers jumped by 10.7%,[54] reflecting the growing popularity of these more convenient payment methods.

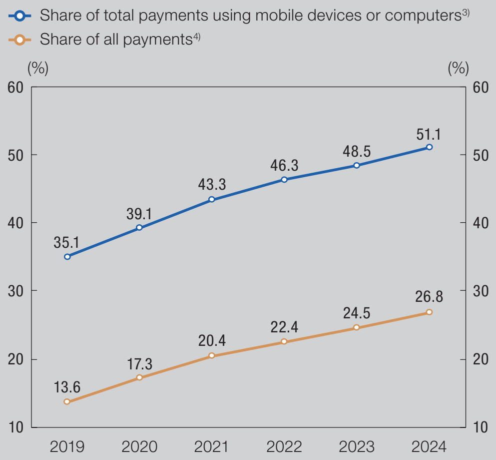
Value of payment card[1)] transactions by method (daily average)[2)]

(KRW billion, %)

	2022	2023	2024	% change
Device-present payments	1,645	1,755	1,755	0.0
(Physical cards)	1,416	1,443	1,411	-2.3
(Mobile devices or computers)	229	311	345	10.7
Device-not-present payments	1,101	1,163	1,210	4.1
Total	2,746	2,917	2,966	1.7

Notes: 1) Based on credit card and check card transactions.
2) Based on card transactions by individuals and corporations conducted at accepting merchants in Korea (preliminary value).
Sources: Stand-alone card companies.

Share of card-based easy payment service usage[1)2)]



Notes: 1) Based on credit card and check card transactions.
2) Based on card transactions by individuals and corporations conducted at accepting merchants in Korea (preliminary value).
3) Share of easy payment transactions in total card payments using mobile devices or computers.
4) Share of easy payment transactions in all card transactions.
Sources: Stand-alone card companies.

Meanwhile, the adoption of easy payment services[55] has continuously risen among payment transactions conducted using mobile devices or computers as their convenience catches on.

53) Change in the daily average value of device-present payments using physical cards: 7.8% in 2022 → 1.9% in 2023 → -2.3% in 2024.

54) Change in the daily average value of device-present payments using mobile devices or computers: 46.9% in 2022 → 35.7% in 2023 → 10.7% in 2024.

55) A digital wallet service in which users' card information is stored with the service provider and payments are authorized through an easy authentication process using password or biometric data, including fingerprints or facial images.

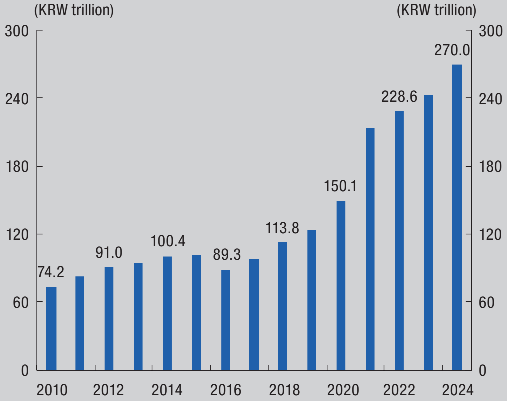
Box I-2.

Securities Custody Services by the BOK

Background

In the wake of the 2008 Global Financial Crisis, central banks and international financial institutions around the world started to increase their investment into Korean bonds to both diversify their foreign reserve assets and enhance their investment returns. Since 2015, the BOK has provided securities custody services to foreign public institutions in an effort to better meet the growing demand for domestic bonds by expanding the investment infrastructure, as well as to strengthen international cooperation.

Foreign portfolio investment in domestic bonds (based on year-end balance)



Source: FSS.

Overview

The BOK offers securities custody services to public institutions, such as foreign central banks, governments, and international financial institutions, that invest in Korean Treasury Bonds, Korean Treasury Bills, Foreign Exchange Stabilization Fund Bonds, or Monetary Stabilization Bonds. Services provided by the BOK cover most of the core custodial tasks, including the safekeeping of securities, record-keeping, settlement of transactions and notification of settlement results, collection of principal and interest payments, and the reconciliation of positions.

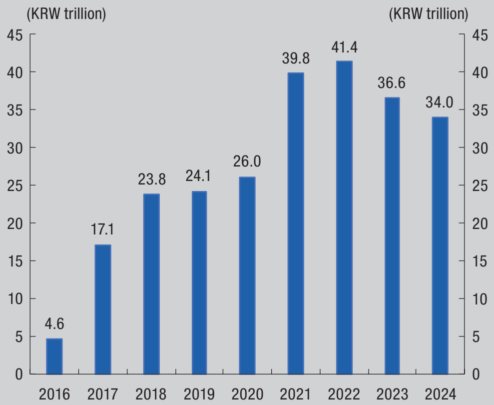
Custody services

Eligible customers	Eligible securities	Services
Foreign central banks Foreign governments International financial institutions	Korean Treasury Bonds Korean Treasury Bills Foreign Exchange Stabilization Fund Bonds Monetary Stabilization Bonds	Safekeeping of securities, record-keeping, settlement of transactions, notification of settlement results, collection of principal and interest payments, reconciliation of customer positions, etc.

Source: Bank of Korea.

As of the end of 2024, the BOK maintained agreements to provide securities custody services with six foreign central banks and one international financial institution. The aggregate balance of domestic bonds under its custody stood at nearly KRW 34.0 trillion.

Securities in the BOK's custody (based on year-end balance)

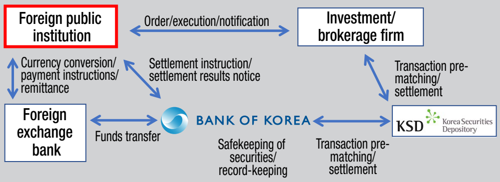


Source: Bank of Korea.

Settlement of Bonds

All bond transactions are settled on a DvP basis. Customer institutions directly trade bonds by entering into a transaction agreement with a broker as the counterparty. In such cases, the customer institution sends settlement instructions, including transaction details, to the BOK via SWIFT. Meanwhile, the details of the same transaction are reported by the broker by entering them in e-SAFE, the KSD's securities depository and settlement information network. Before the date of settlement, the BOK pre-matches the transaction by cross-checking the settlement instructions transmitted by the customer institution and the transaction details reported by the broker. After the settlement of the transaction, the customer institution is notified of the results through SWIFT. Payment instructions for funds transfers between customer institutions and the BOK, in connection with a bond transaction, are also transmitted through SWIFT. Funds transfers are settled in BOK-Wire+ according to customer instructions.

Settlement of bonds in custody



Source: Bank of Korea.

Benefits of Securities Custody Services

By providing foreign public institutions with reliable infrastructure for investing in the Korean bonds market, the BOK's securities custody services help attract more investment demand for Korean Treasury Bonds, Korean Treasury Bills, Foreign Exchange Stabilization Fund Bonds, and Monetary Stabilization Bonds. Moreover, since foreign public institutions tend to be long-term investors that do not frequently trade or liquidate their positions, this has likely contributed to the stability of domestic financial and foreign exchange markets. As the inclusion of Korean government bonds in the World Government Bond Index (WGBI)[56] in October 2024 (actual inclusion is scheduled for April 2026) is expected to lead to a sharp increase in foreign investors' portfolio investment in domestic bonds, active efforts are underway to enhance the convenience of these securities custody services.

56) The WGBI is a broad benchmark for the global fixed-income market, measuring the performance of government bonds across 26 countries. The WGBI is an advanced bond index maintained by FTSE Russell (a subsidiary of the London Securities Exchange Group (LSEG) that manages and publishes market indices), which is tracked by an estimated USD 2.5 trillion of assets.

WGBI weighting by country (as of October 2024)

Country	Weighting (%)	Country	Weighting (%)
U.S.	40.4	Japan	10.2
China	9.7	France	6.7
Italy	6.0	Germany	5.2
U.K.	4.8	Spain	4.0
Korea (after full inclusion)	2.2	Israel	0.3
New Zealand	0.2		

Source: Ministry of Economy and Finance.

Sustained efforts have been made to upgrade IT infrastructure that is essential for custody services, including the adoption of SWIFT ISO 20022 in keeping with the migration to the new standard by the international community. A cash management service was also recently introduced.

In tandem, the BOK is increasing its involvement in international cooperation on relevant areas. The BOK takes an active part in conferences among central banks that provide securities custody services,[57] sharing its experiences of offering custody services and suggestions for improvement, and discussing key issues facing the global securities markets.

57) An annual international conference has been held since 2013 by a consultative group composed of central banks and international financial institutions that provide custody services, including the Federal Reserve Bank of New York (FRB NY), the European Central Bank (ECB), the Bank of England (BoE), the Reserve Bank of Australia (RBA), the Banque de France (BDF), the Deutsche Bundesbank (DBB), the Bank of Canada (BoC), De Nederlandsche Bank (DNB), the Bank of Japan (BOJ), the People's Bank of China (PBoC), the Bank of Korea (BOK) and the Bank for International Settlements (BIS).

II

Enhancement of the Safety and Convenience of Payment and Settlement Systems

1. Stable Operation of Large-Value and Retail Payment Systems

Increase in the Net-Settlement Collateral Ratio and Automation of the Collateral Haircuts Assessments

Consistent with the recommendation under the Principles for Financial Market Infrastructures (PFMI), which calls for credit risk in payment and settlement systems to be fully covered, the BOK, since 2016, has made progressive upward adjustments to the collateral ratio related to the net settlement obligations of retail payment system participants, raising it from an initial 30% to 100% of the net debit cap. A staged approach was adopted to avoid a sudden increase in collateral burdens for financial institutions. During the COVID-19 pandemic, planned increases to the collateral ratio were postponed or the collateral ratio was temporarily lowered in some cases as part of the measures undertaken to stabilize the financial markets.

In August 2023, when relative stability was restored in the financial markets, the BOK raised the net-settlement collateral ratio to 80% from the previous 70%. In August 2024, it was again raised from 80% to 90%. The net-settlement collateral ratio is scheduled to rise to 100% in August 2025. Once this ratio is brought to 100%, some updates will be made to other risk management mechanisms, including the discontinuation of the loss-sharing arrangements for retail payment systems operating under the net debit cap.

Table II-1. Net-settlement collateral ratio[1)]

(%)

Apr. 2020	Feb. 2022	Aug. 2023	Aug. 2024	Aug. 2025
50	70	80	90	100

Note: 1) (∑Post-haircut value of collateral/net debit cap)×100
Source: Bank of Korea.

To reduce the burden on financial institutions resulting from a higher collateral ratio, the BOK expanded the range of net settlement collateral-eligible securities. In July 2023, bank bonds, bonds issued by public institutions, local government bonds, and prime corporate bonds were added to the list of eligible securities. In September 2024, covered bonds[58)] were also included.

58) Covered bonds are long-term bonds issued by financial institutions that are secured by a separate pool of high-quality assets (residential mortgages, etc.), known as the cover pool. By providing investors with an extra layer of credit protection, issuing institutions are able to raise funds for longer durations at lower interest rates. The advantage for investors is that covered bonds are safer from bankruptcy risk than general secured bonds or asset-backed securities (ABS) due to the dual recourse protection whereby they have a claim on both the issuing institution and the underlying asset pool. Underlying assets in the cover pool can be redeemed or sold while the bond is outstanding. In such cases, the redeemed or sold assets are replaced with equivalent assets to continue to provide security to investors. Due to these characteristics, covered bonds are considered a stable long-term investment vehicle.

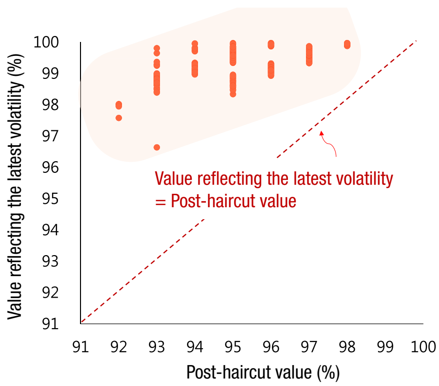
Table II-2. Expansion of the coverage of eligible securities for net settlement collateral requirements

Eligible collateral securities	Change
· Government bonds, monetary stabilization bonds, government-guaranteed bonds, Korea Housing Finance Corp. MBSs, special bank bonds	—
· Bank bonds, securities issued by nine public institutions, other public institution bonds, local government bonds, prime corporate bonds	Range extended (July 2023)
· Covered bonds	Newly added (September 2024)

Source: Bank of Korea.

In accordance with the recommendation from the Financial Sector Assessment Program (FSAP) carried out in 2013 by the International Monetary Fund (IMF), the BOK conducts a quarterly review of the adequacy of collateral haircuts.[59] In July 2024, a new system was set up to automate the haircut review process. Collateral haircuts vary according to the type of collateral securities, the remaining maturity, and the interest payment method. As the new system automatically collects and processes necessary valuation data, and assesses the post-haircut value of collateral securities against a value that considers interest rate volatility,[60] this has made it possible for the BOK to continually assess adequate haircut ratios as the need arises. When warranted by changes in financial market conditions, the BOK now has the ability to quickly reassess haircut ratios to be applied to net settlement collateral and take necessary actions.

Figure II-1. Screenshot of the automatic net settlement collateral haircut review system[1]



Note: 1) The X axis depicts the post-haircut value of a security and the Y axis represents the value of the same security calculated to reflect the volatility of spot government bond interest rates over the most recent 1,000 days. If the value reflecting interest rate volatility (Y) is greater than the post-haircut value (X) (Y>X, Y above the 45° line), the haircut ratio is considered conservative.

Source: Bank of Korea.

Bolstering Virtual Asset Analysis

Following the entry into force of the Act on the Protection of Virtual Asset Users on July 19, 2024, which grants the BOK the right to request the submission of data from virtual asset service providers[61], the BOK amended the "Regulation on the Bank of Korea's Request for Examination of Financial Institutions." As

59) Post-haircut value of a collateral security relative to its market value or par value (issuance value for bonds issued at a discount).

60) The assessment compares the post-haircut value of a security with its value calculated by reflecting the latest interest rate volatility. The latter value is calculated based on daily time series data, using a VaR (Value at Risk, maximum potential losses over a specific time horizon at a given confidence level) model.

61) Article 16 (Requests for Submission of Data by the Bank of Korea) of the Act on the Protection of Virtual Asset Users: If deemed necessary by the Monetary Policy Board to implement monetary and credit policies and to facilitate the smooth operation of payment and settlement systems in relation to virtual asset transactions, the Bank of Korea may request a virtual asset service provider to submit data. In such cases, the data requested shall be limited to a minimum extent necessary, fully taking into account the workload of the relevant virtual asset service provider.

part of this, requirements for requesting the submission of data were established, including the types of entities subject to the request (virtual asset service providers) and the scope of data that can be requested (information related to virtual asset transactions). In addition, the types of data to be submitted and the submission frequency were specified.

During 2024, the BOK requested the submission of data to monitor virtual asset markets. Going forward, it will further intensify its monitoring and analysis of these markets and information, such as number of investors, balances of investors' deposits and virtual asset holdings, inflows and outflows of virtual assets, and transaction values per virtual asset class, will be gathered on a regular basis. For stablecoins,[62] which have the potential to scale as payment instruments, more in-depth data will be collected, including transaction values and cross-border flows. These data will be utilized in the analysis of vulnerabilities in domestic virtual asset markets and the impact of their growing interconnectedness with the traditional financial system. The results of the analysis will be reflected in future monetary policies and used to improve the BOK's operation of payment and settlement systems and financial stability-related business.

A New Financial Solvency Standards Criterion Adopted for Non-Bank Deposit-Taking Institutions' Participation in BOK-Wire+

In consideration of the rising influx of deposits into non-bank deposit-taking institutions and the impact of advances in the digitization of finance on financial stability, in February 2024, the BOK decided to include federations of non-bank depository institutions and mutual savings banks among eligible counterparties to its open market operations. Accordingly, the BOK revised the "Sub-Regulation on the Operation and Management of the Payment and Settlement Systems" to allow for the participation of these non-bank depository institutions in BOK-Wire+.

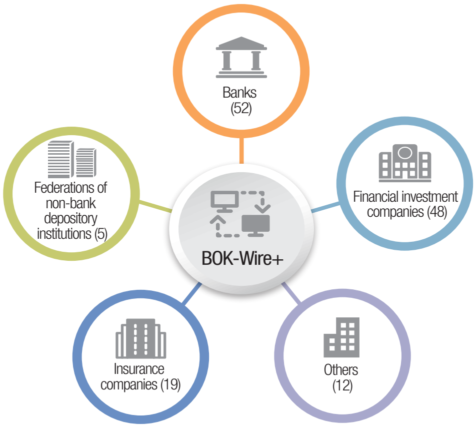
In order to participate in BOK-Wire+, a financial institution must be eligible to hold a current account with the BOK and must satisfy a set of other criteria established by the BOK related to financial solvency standards, expected usage numbers, reponsible personnel, and business continuity. While the participation requirements for non-bank deposit-taking institutions are, for the most part, the same as those for other types of fianacial isntitutions, a new financial solvency standards criterion was introduced to take into account their special risk profiles.[63] This allowed the scope of

62) Stablecoins are virtual assets that are designed to minimize price volatility by pegging their value to a legal tender (e.g., Tether, USD Coin).

63) The new criterion requires a savings bank's equity capital to be equal to at least 7% of its risk-weighted assets, as defined in the "Supervisory Regulation on Savings Banks." Financial solvency standards for other types of institutions, including the National Credit Union Federation of Korea (equity capital equal to at least 5% of risk-weighted assets as defined in the "Supervisory Regulation on Mutual Finance Businesses"), the National Agricultural Cooperative Federation and the National Forestry Cooperative Federation (reserves after loss coverage equal to at least 2% of risk-weighted assets as defined in the "Supervisory Regulation on Mutual Finance Businesses"), and the Korea Federation of Community Credit Cooperatives (equity capital equal to at least 5% of risk-weighted assets as defined in the "Supervisory Regulation on Community Credit Cooperatives"), which were not previously incorporated into the regulations, are now reflected in "Sub-Regulation on the Operation and Management of the Payment and Settlement Systems."

BOK-Wire+ participants to be expanded while ensuring the stable operation of the large-value payment system.

Figure II-2. Participants in BOK-Wire+[1)]



Note: 1) As of the end of December 2024.
Source: Bank of Korea.

Leveraging AI to Strengthen the Monitoring of Retail Payment Systems

For early detection of warning signs of a bank run and a timely response, the BOK is conducting research into the application of AI to monitor funds transfer data of retail payment systems in real time.[64)] The current objective is to develop an AI model that is capable of analyzing real-time funds transfers initiated in retail payment systems operated by the KFTC to spot concerning patterns. An LLM-based AI model is also under development for timely detection of negative news about a financial institution that spread on news websites and social media. After sufficient validation, these AI models will be used as assistive tools together with other indicators, such as net debit cap utilization rates, to monitor for troubling signs in retail payment systems.

64) Although attempts to leverage AI in the oversight of payment and settlement systems have already been made by the Bank of Canada and the BIS, this is still a new research field globally. To help guide its own AI research, the BOK broadly draws on international studies on relevant topics.

2. Increasing the Convenience of Payment Instruments

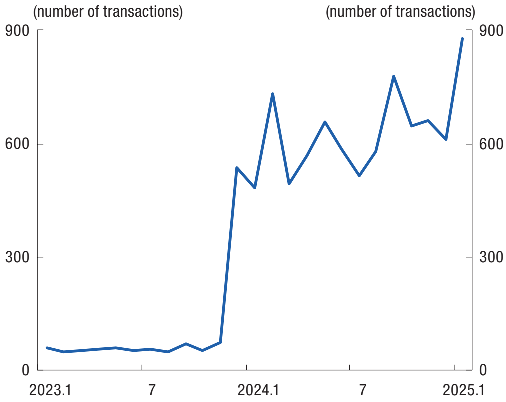
Broadening the Adoption and Coverage of Mobile Cash Card Services

Increased Usage of Universal QR Code-Based Cardless ATM Services

On December 6, 2023, the Committee on Financial Informatization Promotion (CFIP), chaired by the Senior Deputy Governor of the BOK, in cooperation with the KFTC and 17 domestic financial institutions, rolled out a new feature for mobile cash cards[65] that allow users to conduct cardless ATM transactions using a universal QR code. Previously, the mobile cash card app was only usable with Near Field Communication (NFC)[66]-enabled ATMs. Supported devices were also limited to Android smartphones. Because of this, despite their convenience, the usage of mobile cash card ATM services did not become widespread. However, the introduction of QR code access,[67] which is not bound to certain types of smartphones or requiring NFC support, has led to an increase in transactions, particularly during holiday periods in which there is often a higher demand for cash.

Looking ahead, to further facilitate consumers' access to cash, the CFIP will extend the supported network of ATMs to those operated by independent ATM deployers (convenience store ATMs, etc.), in addition to bank ATMs.[68]

Figure II-3. Usage of mobile cash card ATM services[1)]



Note: 1) On a daily average basis.
Sources: Bank of Korea, KFTC.

Interlinking Mobile Cash Card with Samsung Wallet

To increase the awareness of the mobile cash card and diversify its service channels, the CFIP signed an MOU with the KFTC and Samsung Electronics (September 26, 2024) to facilitate interlinking the mobile cash card with Samsung Wallet.[69]

65) Mobile cash cards were introduced in June 2020 in order to respond to the mobile transition of financial services, to lower cost burdens for merchants associated with credit card processing fees, and to balance growth of the payment market that had been dominated by credit cards and other high-cost payment instruments. Currently, mobile cash cards can be used for CD/ATM transactions, payments for goods and services (debit payments), and for depositing change at participating stores into a customer's bank account.

66) NFC is a wireless technology that allows devices within close proximity to exchange data, typically within 10cm.

67) Since its introduction in late 2023, QR code access quickly gained momentum and currently makes up the vast majority (93.8%) of ATM transactions conducted using the mobile cash card.

68) As of the end of 2023, 47,000 bank ATMs and 49,000 ATMs operated by independent deployers were in service across the country.

In April 2025, cross-platform services were enabled between the mobile cash card and Samsung Wallet. This has made it possible for mobile cash card users to also use Samsung Wallet to conduct ATM transactions, deposit change at participating merchants, and pay with QR codes. Meanwhile, Samsung Wallet users can unlock a wider network of supported financial institutions[70] for cardless ATM access by simply registering with the mobile cash card. The CFIP will continue to strive toward the goal of increasing convenience for consumers by developing new services and by expanding the network of participating merchants.

Figure II-4. MOU signing between the BOK, the KFTC, and Samsung Electronics

Source: Bank of Korea.

Revision of CD/ATM Standards for Users with Special Needs

In December 2024, the CFIP revised the "CD/ATM Standards for Users with Special Needs."[71] This document, established in June 2010, sets out accessibility standards for CDs/ATMs to ensure convenient access to basic financial services by disadvantaged groups, such as persons with disabilities and the elderly.

This revision brings the CD/ATM standards in line with the recent amendments to the Act on the Prohibition of Discrimination against Persons with Disabilities and Remedy against Infringement of Their Rights and its Enforcement Decree,[72] and adds new regulatory requirements, including for an audio alert system to warn users when a card is inserted the wrong way and for a special flooring material in the access area in front of a machine.

Promoting Financial Inclusion by Maintaining Access to Cash

Cash is a universal payment instrument that can be used anywhere. Cash plays a critical role in promoting financial inclusion by supporting the economic activity of financially

69) The mobile cash card service integration initiative is open to all domestic and foreign-affiliated payment service providers. The final decision on the approval of a new provider interested in offering mobile cash card-linked services will be made in consultation with the KFTC, the program operator, and member banks.

70) Samsung Wallet is currently partnered with 10 financial institutions to provide cardless ATM access, while the mobile cash card is supported by 17 financial institutions.

71) The CD/ATM Standards for Users with Special Needs were prviously revised three times (2011, 2012, and 2018) to reflect the changing environment surrounding electronic finance and financial services.

72) Paragraphs 3 and 4 of Article 15 of the Act on the Prohibition of Discrimination against Persons with Disabilities and Remedy against Infringement of Their Rights (amended July 2021 and entered into force January 2023) mandate installers and operators of kiosks to guarantee access for persons with disabilities. Paragraph 2 of Article 10-2 of the act's Enforcement Decree (entered into force March 2023) also requires installers and operators to provide "reasonable accommodation."

vulnerable groups.[73] A decline in cash acceptance and access presents the risk of restricting economic activity among financially vulnerable groups that are cash reliant.

Based on consumer-reported cases where a business refuses cash as a form of payment instrument[74] and similar factors, the current pace of decline in cash acceptance in Korea is not severe enough to warrant immediate concern. However, if this declining trend persists into the future, it can negatively impact the operations of institutions participating in the monetary circulation system and create a social atmosphere in which cash is increasingly shunned, thereby reducing the availability of cash-related services.

The BOK has engaged in extensive and varied efforts to sustain the acceptance and accessibility of cash at an appropriate and sufficient level. In order to ensure an efficient circulation of cash and improve the convenience of using cash for the public, the BOK endeavors to maintain the stability of the monetary circulation system within the economy. During the second half of 2024, the "Cash System Council,"[75] a consultative body for the comprehensive management and enhancement of the domestic monetary circulation system, was expanded and reorganized. Three subcommittees, "cash infrastructure," "cash accessibility," and the "right to use cash," were formed in order to increase the efficiency of information sharing and the operation of the council. Moreover, active monitoring and research on the acceptance and accessibility of cash, including fact finding on cashless stores and studies investigating situations in other major countries, are being conducted.

To widely raise the awareness of the importance of guaranteeing consumers' right to use cash,[76] public campaigns are carried out using a variety of channels. During 2024, an appropriate cash use promotion contest[77] for young people was organized and winning entries were showcased on the BOK's website

73) In the Eurosystem cash strategy, the European Central Bank stated that cash is public money to which everyone has direct access and that it is essential for financial inclusion. In Sweden, in response to the deterioration of financial inclusion resulting from the decline in cash usage, its government has required County Administrative Boards to conduct an annual assessment to determine whether cash and other payment instruments meet the basic needs of residents in their jurisdictions and report the results to the Parliament.

74) In a survey of Korean consumers, only 6.9% of total respondents reported to have had the experience of cash payments being rejected ("Cash Use Survey by Type of Economic Agents," June 2022), significantly lower than the corresponding figures in surveys conducted in the U.K. (35%), Sweden (37%), and in Australia (over 30%).

75) The participants of this council, which is led by the BOK and the Korea Minting, Security Printing & ID Card Operating Corp. (KOMSCO), are institutions and companies that play an important role in the monetary circulation system, such as financial institutions, cash-in-transit companies, independent ATM deployers, and retail and distribution businesses.

76) The right to use cash, which means that consumers are free to choose cash as a payment instrument, is legally protected in Denmark, France, and some states and cities in the U.S.

77) During 2024, the contest called for submissions of video and infographic news content on themes, such as promoting the right to use cash, preventing the circulation of counterfeit currency, handling currency with care, reusing coins, and improving access to cash (newly added). Of the 258 total submissions received (82 video works, 176 card news), 10 were selected as prize winners.

and social media pages. Posters and videos were also produced and displayed at financial institutions, in public transport, and on online platforms.

Figure II-5. Poster on the right to use cash

Source: Bank of Korea.

Meanwhile, regional imbalances in the availability of ATMs[78] have worsened in recent years, raising concerns that these imbalances could limit access to cash for people residing outside the capital area. This is because while financial institutions and independent ATM deployers are eager to add ATMs in the densely-populated capital area to increase customer contact points, they are gradually cutting back on the number of units serving provincial areas, which tend to be less frequently used. If the current disparity in the availability of ATMs is left unaddressed, it can have detrimental consequences for monetary circulation infrastructure, ultimately hindering the public's access to cash.

Despite the widespread adoption of digital payment instruments brought about by technological innovation, cash still remains the basic payment instrument used by the public in their day-to-day economic activities. ATMs are critical infrastructure that play a vital role in ensuring access to cash.

As a central bank issuing legal tender, the BOK will work toward the medium- to long-term goal of enhancing the efficiency of ATM networks and expanding the public's access to cash. To this end, the BOK, together with relevant institutions and related industries, will explore concrete ways to boost the efficiency of ATM operations and achieve balanced distribution across the country.

78) The number of ATMs per 1km^2, which stood at 32.9 in Seoul and 0.4 in Gyeongsangbuk-do and Jeollanam-do at the end of 2022, dropped to 28.4 and 0.3, respectively, as of March 2025, indicating that the high level of disparity between regions persisted amid the overall decline in the availability of ATMs nationwide.

Box II-1.

Characteristics of Funds Transfers during IPO Periods and Settlement Risk of Financial Institutions

IPO Trends

In 2024, the total value of IPO subscription deposits (based on individual investors) reached KRW 353.0 trillion,[79] representing an increase of KRW 56.7 trillion over the previous year (KRW 296.3 trillion). After hitting a record of KRW 786.4 trillion in 2021, a year with a high number of large-size IPOs worth KRW 10 trillion or more (22), the value fell thereafter for two consecutive years.[80] In 2024, IPO subscription deposits reverted to growth due to a new uptick in the number of large-size IPOs. The total number of IPOs per year has remained around 80 since 2021.

IPOs by year

(KRW trillion, number)

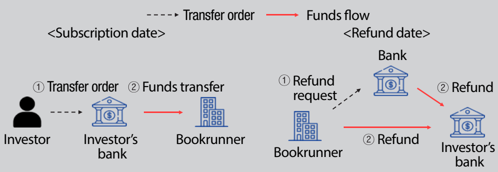
		2020	2021	2022	2023	2024
Overall	Subscription deposits	342.3	786.4	315.7	296.3	353.0
	Number	70	89	70	82	77
Large-size IPOs	Subscription deposits	160.7	558.6	179.7	88.5	119.2
	Number	4	22	6	5	8

Sources: Financial investment companies.

During IPO periods, there are large movements of funds to and from financial investment companies that coordinate the IPO process as lead underwriters ("bookrunners") over a short period of time. This exposes large numbers of financial institutions to settlement risk.

During the subscription period, large amounts of funds flow out of investors' accounts at banking institutions such as banks and credit unions. On refund dates, when excess funds from unsuccessful IPO applications are refunded to investors, there is an equally sizable movement of funds from refunding institutions (bookrunners, banks holding IPO subscription deposits, partner banks processing funds transfers). This can push up financial institutions' net debit positions close to their net debit caps.

Flow of funds during IPOs

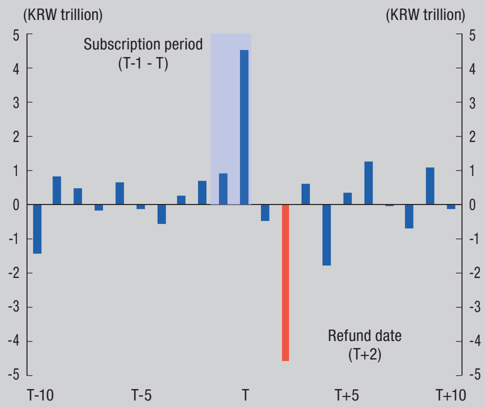


79) Based on regular listed IPOs, excluding SPACs and REITs (the same hereafter). If the latter are included, the total value rises to KRW 418.8 trillion.

80) IPO subscription deposits declined from 2022 following the amendment to the Enforcement Decree of the Financial Investment Services and Capital Markets Act (entered into force June 20, 2021), which prohibits individual investors from subscribing to an IPO through more than one financial investment company when the IPO has several bookrunners.

In 2024, during large-size IPOs (including subscription and refund dates), the net daily average value of funds transferred to financial investment companies[81] amounted to KRW 3.3 trillion (KRW 4.5 trillion on the day with the highest volume),[82] which is nearly 5.1 times the corresponding value (KRW 0.7 trillion) outside these periods (10 business days before and after the subscription opening date).

Net funds transfers[1] associated with large-size IPOs to and from financial investment companies in 2024, during 10 business days before and after the subcription opening date



Note: 1) Incoming transfers to financial investment companies less outgoing transfers.
Source: Financial investment companies.

Funds Transfers during Large-Size IPOs in Recent Five Years (2020-2024) and Settlement Risk Trends

Funds transfers from investors' banking institutions to bookrunners during large-size IPOs tend to spike on the closing date. This pattern of concentration of payments on the subscription closing date has increased in recent years (71.5% in 2020 → 90.0% in 2024).

Value and share of funds transfers from investors' banking institutions to bookrunners during large-size IPOs[1] and date-based breakdown, by year

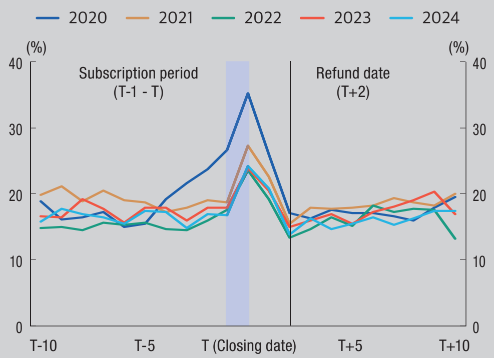
(KRW trillion, %)

Value of funds transfers		2020	2021	2022	2023	2024
Transfers to bookrunners	Total	28.9	19.9	20.3	16.3	12.5
	Subscription opening dates	8.2	4.5	4.8	2.1	1.2
		(28.5)	(22.5)	(23.6)	(12.9)	(10.0)
	Subscription closing dates	20.7	15.5	15.5	14.2	11.2
		(71.5)	(77.5)	(76.4)	(87.1)	(90.0)
Total incoming transfers		40.2	25.4	29.9	17.7	14.9

Notes: 1) Average value of funds transfers for each large-size IPO based on incoming payments.
2) Figures in ( ) are the values of funds transfers processed on the subscription opening and closing dates as a % share of total transfers.
Source: Bank of Korea.

However, as the value of funds transfers per IPO has progressively decreased (KRW 40.2 trillion in 2020 → KRW 14.9 trillion in 2024), this has allowed financial institutions[83] to keep their net debit positions safely under their net debit caps. From 2022, the maximum net debit cap utilization rate on subscription closing dates has stabilized in a low 20% range.

Maximum net debit cap utilization rate of financial institutions between 10 business days before and after the subscription opening date



Source: KFTC.

81) Incoming transfers to financial investment companies conducted through retail payment systems less outgoing transfers.
82) Based on the absolute value of net transfers.
83) Banks (29), financial investment companies (29), and credit unions (5) participating in retail payment systems.

While the number of financial institutions whose net debit cap utilization rates exceeded 50% on subscription closing date[84] fell sharply (18 in 2020 → 9 in 2024), this is still twice the corresponding number outside subscription periods.

Number of financial institutions whose net debit cap utilization rates exceeded 50% between 10 business days before and after the subscription opening date

(number of institutions)

Dates	2020	2021	2022	2023	2024
Subscription opening date (T–1)	10	6	5	5	5
Subscription closing date (T)	18	12	9	9	9
Refund date (T+2)	6	5	4	5	5
Other dates[1]	4	5	4	5	5

Note: 1) Average of dates other than the opening, closing, or refund date (T–10 - T–2, T+3 - T+10).
Source: Bank of Korea.

Management of Settlement Risk

To prevent a surge in settlement risk from massive amounts of funds transferred during subscription periods, the BOK encourages financial institutions to take steps before an IPO season to ensure their net debit caps are sufficiently above their net debit positions.

To contain potential disruptive effects of large movements of funds, banks may raise their net debit caps when necessary and financial investment companies may route transfers through partner institutions. They may also intensify the monitoring of net debit positions during IPOs so that they can quickly respond to sudden spikes in their net debit cap utilization rates.

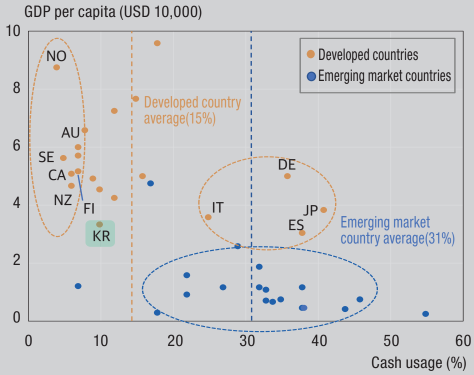
84) 50% of the net debit cap is the threshold used by financial institutions for internal monitoring purposes. The BOK recommends that financial institutions keep their net debit cap utilization rates no more than 70% in order to reduce settlement risk exposure.

Box II-2.

Assessing Korea's Cash Usage in Light of Factors Driving Differences in Developed Countries

The use of cash[85] has been declining worldwide amid innovations in electronic payment instruments. Cash usage tends to be lower in high-income developed countries with mature financial systems than in emerging market countries.[86] Nevertheless, significant variations in cash usage exist even among developed countries due to disparities in socioeconomic conditions and cultural differences. In this section, factors influencing the use of cash in developed countries will be explored and compared with those of Korea.

Differences in cash usage between developed and emerging market countries (as of 2023)

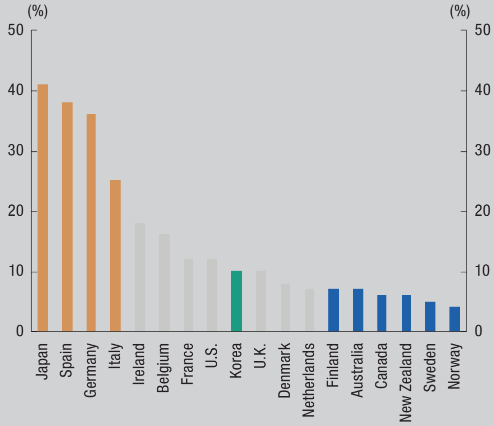


Sources: Worldpay (2023), World Bank, IMF.

Variations in Cash Usage among Developed Countries

As of 2023, the average use of cash in 40 countries (based on simple averages of each country) stood at about 23%. The average among developed countries amounted to only 15%, a little less than one half the corresponding figure for emerging market countries (31%). However, in some developed economies, such as Japan, Spain, Germany, and Italy ("high cash-usage countries"), cash usage is quite high, averaging nearly 35%. In contrast, in Nordic countries, such as Norway, Sweden, and Finland, and Commonwealth countries, such as New Zealand, Canada, and Australia ("low cash-usage countries"), the average cash usage is in the 6% range, suggesting that wide disparities exist between developed countries. For comparison's sake, cash usage in Korea is currently at about 10%, which places it in the middle of developed countries.

Disparities in cash usage among developed countries (as of 2023)



Source: Worldpay (2023).

85) Cash payments made by consumers in offline stores as a % share of all payments, based on value.

86) Countries were divided into developed and emerging market countries according to IMF classification ("IMF World Economic Outlook," 2024).

Causes of Differences in Cash Usage

In order to determine the causes of differences in cash usage among developed countries, a broad variety of factors were examined, while excluding the level of economic development. Factors liable to influence cash usage were divided into three large categories: (1) economic structure, (2) socio-demographic structure, and (3) cultural and historical context. Next, a series of detailed indicators that are representative of these factors[87)] were selected and countries were compared against the selected indicators to assess the existence of significant differences between them. The following discussion will focus on those indicators with regard to which significant differences were observed between high cash-usage countries and low cash-usage countries.

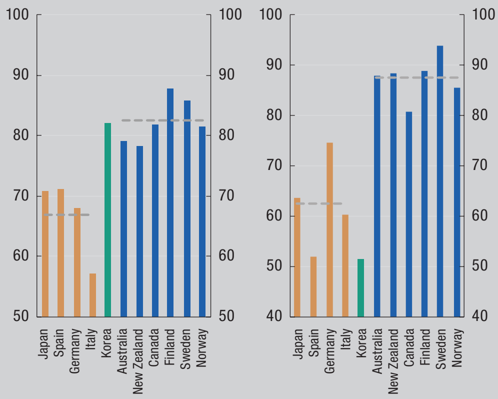
Factors causing extreme differences in cash usage among developed countries[1)]

Factor	Economic structure	Socio-demographic structure	Cultural and historical context
Detailed indicators	-Digital infrastructure (–) -Underground economy (+) -Efficiency of business regulation (-)	-Population share of the elderly and low-income persons (+) -Population density (number of ATMs per land area) (+)	-Public trust in government (–) -Risk avoidance tendency (+)

Note: 1) (+) indicates factors that contribute to an increase in cash usage and (–) indicates factors that cause a decrease in cash usage.

Among factors related to economic structure, differences among developed countries were found to be most salient regarding digital technology competitiveness, a key enabler of the introduction and adoption of electronic payment infrastructures, and efficiency of business regulation. Both digital technology competitiveness and efficiency of business regulation were higher in low cash-usage countries than high cash-usage countries.

Digital competitiveness[1)3)] **Efficiency of business regulation[1)2)3)]**



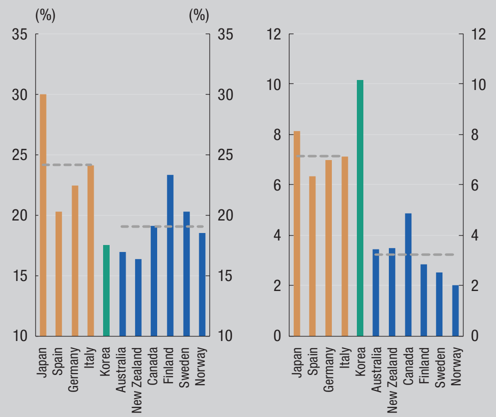
Notes: 1) Dotted lines represent group averages.
2) Index based on country rankings in 2020-2024 (index=100-ranking)
3) Digital competitiveness and efficiency of business regulation are higher in low cash-usage countries.
Source: IMD (2023).

In terms of socio-demographic structure, countries showed clear differences in terms of the population share of the elderly and low-income persons and the population density-based number of ATMs. The elderly and low-income persons are highly cash-reliant, likely due to the fact that their limited income and poor credit ratings make it more difficult for them to be approved for a credit card, and their low digital literacy skills also contribute to this dependency. The number of ATMs appears to have a considerable

87) The detailed indicators are grouped as follows: for economic structure, digital technology competitiveness, educational infrastructure, size of the underground economy, and efficiency of business regulation; for socio-demographic structure, population share of the elderly and low-income persons, perceived lack of public assistance, poverty rate, Gini coefficient, population density, and number of ATMs per land area; for cultural and historical context, public trust in government and risk avoidance tendency.

influence on cash usage as they are the main channel for access to cash.

Population share of the elderly[1)2)4)] **Number of ATMs relative to population and land area**[1)3)4)]

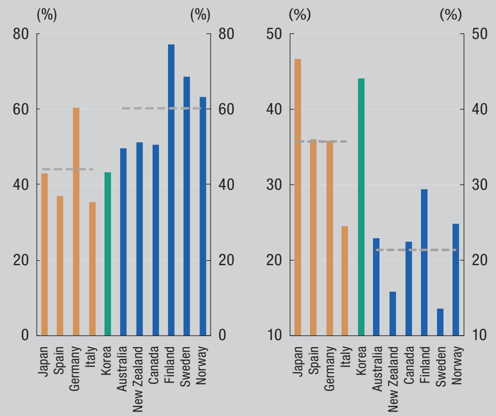


Notes: 1) Dotted lines represent group averages.
2) Population share of people aged 65 and older.
3) In (number of ATMs² /total population x total land area)
4) The population share of the elderly and the number of ATMs are higher in high-cash usage countries.
Source: OECD (2023).

Among the cultural and historical context factors, there were sizable differences between high cash-usage and low cash-usage countries in regard to public trust in government and risk avoidance tendency. Low levels of public trust in government appear to be associated with a tendency towards cash transactions, which could be explained by greater apprehensions about personal data breaches from the use of non-cash payment instruments as well as the lack of confidence in financial and payment systems.[88)]

Meanwhile, the higher the risk avoidance tendency, the stronger the preference for cash was found to be. The main perceived risks of non-cash payments, which require intermediation by financial institutions, are processing errors and natural disasters.[89)]

Public trust in government[1)2)4)] **Risk avoidance tendency**[1)3)4)] **(households' preferences for safe assets)**



Notes: 1) Dotted lines represent group averages.
2) Based on the results of public surveys.
3) Households' bank deposits divided by total financial assets (balance). For New Zealand and Canada, cash and deposits relative to total financial assets.
4) Public trust in government is higher in low cash-usage countries, while risk avoidance tendency is higher in high cash-usage countries.
Source: OECD (2022, 2023).

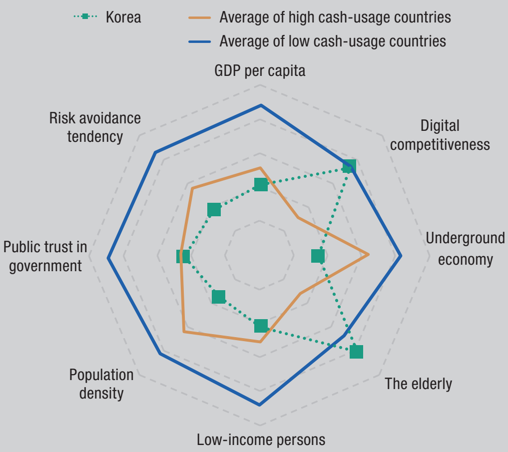
Cash Usage in Korea and Implications

When the determinants of cash usage in developed countries were applied to Korea, the results were similar to high cash-usage countries

88) In Germany, consumers have a strong preference for cash payments despite a comparatively high level of trust in government. This tendency may be attributable to the social climate in which privacy is highly valued, making cash transactions more appealing for their anonymity.
89) In Japan, where natural disasters, such as earthquakes and typhoons, are frequent, there is a significant risk of electronic payment transactions becoming delayed or limited. Because of this, many Japanese consumers prefer paying with cash, which can be used even during disasters and other emergencies.
90) However, cash usage in Korea is lower than in high cash-usage countries. This could be in part attributed to the government's policy to promote the use of credit cards as well as the Specialized Credit Finance Business Act, which prohibits the refusal of credit card payments.

regarding most indicators.[90] Korea's current GDP per capita of USD 33,000 (as of 2023) is closer to income conditions in high cash-usage countries than low cash-usage countries. The size of the underground economy in Korea is also closer to that in high cash-usage countries. On the other hand, in terms of digital technology competitiveness, an important factor promoting the utilization of non-cash payment instruments, Korea is more comparable to low cash-usage countries than high cash-usage countries. Among socio-demographic structure factors, while Korea is similar to low cash-usage countries in terms of population share of the elderly, it more closely resembles high cash-usage countries concerning the population share of low-income persons. Meanwhile, the population density-based number of ATMs in Korea far exceeds corresponding numbers in high cash-usage

Comparison of determinants of cash usage between Korea and other developed countries[1)]



Note: 1) For ease of comparison, the diagram is constructed so that for GDP per capita, digital competitiveness, and public trust in government, the higher the value, the further away it is from the center and for the size of the underground economy, the population share of the elderly and low-income persons, and the population density-based number of ATMs, the lower the value, the further away it is from the center. For example, the value of digital competitiveness is higher in low cash-usage countries than in high cash-usage countries.

Sources: OECD, IMF, World Bank, IMD, UN.

countries. Finally, Korea is also closer to high cash-usage countries in respect to public trust in government and risk avoidance tendency.

Even though the usage of cash shows a secular downward trend in most countries, the speed and severity of this decline can vary significantly depending on the economic structure, the socio-demographic structure, and the cultural and historical context of each country. Given that, when evaluated based on key factors determining cash usage, Korea is similar to high cash-usage countries, the utilization of cash in Korea is unlikely to drop sharply in the short term or plummet to the extreme levels seen in Nordic countries (about 3%). It is more probable that cash usage in Korea will gradually decrease and stabilize at a moderately low level. In other words, the Korean public is likely to continue to use cash as a payment instrument for some time to come. This implies that further efforts are needed to enhance the public's access to cash and guarantee their right to use cash.

Ⅲ

Oversight of Payment and Settlement Systems and Innovation Efforts

1. Increasing the Safety and Resilience of Domestic Financial Market Infrastructure

Regular Assessments of Payment and Settlement Systems and Provisions of Recommendations

In 2024, the BOK carried out its regular assessment of the central counterparty (CCP)[91] for exchange-traded securities and exchange-traded and OTC derivatives, operated by the Korea Exchange (KRX). The assessment was conducted based on 22 of the 24 principles contained in the Principles for Financial Market Infrastructures (PFMI), the Resilience of Central Counterparties (CCPs): Further Guidance on the PFMI,[92] and the Guidance on Cyber Resilience for Financial Market Infrastructures.[93] To ensure the quality and integrity of the assessment, the BOK took into account input from external experts, including cybersecurity specialists.

The assessment found that the KRX broadly observes the PFMI, though it needed some improvement in certain areas, such as in the management of liquidity risk and operational risk. Appropriate recommendations have been issued.

The KRX plans to consider introducing separate liquidity stress testing scenarios, in addition to credit stress testing scenarios, when estimating liquidity resources required to prepare for liquidity risk. Moreover, to increase the predictability of margin requirements for member institutions, it will implement changes necessary to disclose the results of the margin sensitivity analysis, performed during market volatility, to all members, including participants in both OTC and exchange-traded markets.

Concerning operational risk, when calculating net liquid assets required to cover losses incurred in its general businesses, the KRX will now consider expected declines in profit, estimated increases in operating costs, and special non-recurring losses, in addition to the minimum liquidity requirement (six months' worth of operating costs). Furthermore, to manage third-party risks, a growing concern in recent times, it will put in place defined procedures for responding to technical failures experienced at third-party service providers.

Meanwhile, the regular assessment of the securities settlement system operated by the Korea Securities Depository (KSD) is currently in progress and is expected to be completed in the second half of 2025.

91) A CCP, also known as a central counterparty clearing house, guarantees the financial performance of a transaction by acting as the counterparty to both sides of the transaction. Because of this, a CCP takes on liquidity and credit risks associated with the trading activities of its members. When counterparty risk is actualized, a CCP covers resulting losses using pre-funded resources, such as member margins, joint compensation funds, and its own capital reserves. If losses incurred exceed available financial resources, a CCP may request additional joint compensation funds from clearing members, return some of its profits, or increase the capital reserves for the coverage of settlement losses in an attempt to avoid bankruptcy and prevent a member's default from spiraling into a systemic risk.

92) Resilience of Central Counterparties (CCPs): Further Guidance on the PFMI (CPMI-IOSCO, July 2017).

93) Guidance on Cyber Resilience for Financial Market Infrastructures (CPMI-IOSCO, June 2016).

Table III-1. Regular assessments of payment and settlement systems in 2024

Systems subject to assessment	Recommendations for improvement
<KRX> KOSPI market settlement system KOSDAQ market settlement system Derivatives market settlement system	· Use of separate scenarios for credit and liquidity stress testing · Disclosure of the results of the margin sensitivity analysis to clearing members · Development of response procedures for general business risk and third-party risk

Source: Bank of Korea.

Joint Examinations of Banks and Financial Investment Companies

During 2024, the BOK and the Financial Supervisory Service (FSS) jointly examined three domestic banks in order to assure compliance in their payment and settlement activities, focusing on areas such as management of intraday liquidity, net settlement risk, and IT operational risk and information security. Joint examinations were also conducted on two financial investment companies, paying special attention to funds transfer activities and management of settlement liquidity.

Table III-2. Joint examinations of payment and settlement activities in 2024

Institution	Examination period	Items
NongHyup Bank	May 31-June 5 (4 business days)	·Management of intraday liquidity ·Management of net settlement risk ·Compliance with payment and settlement-related guidelines ·Procedures for technical failures and emergency response systems
KB Kookmin Bank	September 2-5 (4 business days)	
Toss Bank	November 15-20 (4 business days)	
NH Investment & Securities	April 26-May16 (12 business days)	·Funds transfer activities ·Management of settlement liquidity
DB Securities	November 18-29 (10 business days)	

Source: Bank of Korea.

The liquidity management procedures of the examined institutions, including monitoring of net settlement risk and liquidity crisis response procedures, such as emergency fundraising and management plans, were generally adequate and in compliance with requirements. Well-defined procedures were also in place for the management of IT operational risk and the protection of data. However, these institutions were found to require improvement in other areas, such as external reporting mechanisms for technical incidents, procedures for managing settlement risk on repo-type CMA, as well as some elements of liquidity crisis procedures, including stress testing. Recommendations for improvements were subsequently provided.

Improvements to Major Financial Market Infrastructure

Payment Systems Operated by Korea Financial Telecommunications and Clearings Institute

In June 2024, the Korea Financial Telecommunications and Clearings Institute (KFTC) established a master plan to enhance the functionality and accessibility of the Open Banking System.[94] Open banking services are currently available only online, which makes them difficult to access for digitally disadvantaged groups who struggle to use internet or mobile banking. To reduce this digital divide, open banking service channels will be expanded to include bank branches so that customers are able to inquire into accounts held at other banks and transfer funds to and from

94) An open banking system allows fintechs and other financial service providers, with appropriate consent, to access customer information for the purpose of providing payment or account aggregation services. Users can simply log into a fintech app or a bank app to dashboard all of their accounts at different institutions in one place and make payments or initiate funds transfers from a selected account.

them at any bank branch of their choice.

In January 2025, corporations were added to the list of eligible users of the Open Banking System, although their access privilege is limited to inquiry of account information. This change allowing corporate users to inquire into their accounts across different banks in one place is expected to make it significantly easier for SMEs to manage funds.

Korea Exchange

In March 2025, the KRX enacted the new "Securities Market Clearing and Settlement Regulations" by merging existing regulations that previously applied separately to individual markets.[95] Although a clearing and settlement house independent from the trading platform was established in April 2021, the existence of multiple sets of regulations for exchange-traded markets was a persistent source of confusion. By consolidating clearing and settlement regulations governing different markets (KOSPI, KOSDAQ, KONEX markets), the new regulations have brought about greater clarity for market participants and increased regulatory efficiency. A single set of regulations also prevents conflicts of interest vis-a-vis an alternative trading system (ATS).[96]

Moreover, an array of other measures were taken as part of ongoing efforts to contain risks that may arise from the introduction of an ATS. In January 2025, the KRX's clearing and settlement system was overhauled to allow clearing consolidation for trades conducted through the ATS.[97] This entailed changing the timing of the calculation of clearing member margins so that it coincides with the ATS closing time (18:00 → 20:00), as well as moving up the deadline for the submission of margins by an hour on the following business day (15:00 → 14:00).[98]

Meanwhile, the KRX is preparing to provide clearing service[99] for Korea Overnight Financing Repo Rate (KOFR)[100] overnight index

95) The new regulations were approved by the Securities and Futures Committee and the Financial Services Commission (FSC) in January and February 2025, respectively, and took effect in March. The KRX also plans to merge the "Derivatives Market Business Regulation" into the new regulations.

96) In a situation where all trades conducted through an ATS, which acts as a competitor to the KRX, are cleared by the CCP operated by the latter, the fragmentation of rules governing the clearing of ATS trades across different markets can create risks of conflicts of interest.

97) For further details, see "Box III-1. Establishment of an Alternative Trading System (ATS) and Impacts."

98) The rise in trading volume following the launch of an ATS can result in higher settlement risk, increasing the likelihood of failure to cover margin calls by a member. To give itself additional time to respond to a liquidity crisis, the KRX moved up the margin deposit deadline.

99) In December 2024, in an effort to broaden the use of the KOFR, the government announced a plan to increase KOFR OIS, which are interest rate swaps using the KOFR as the reference rate ("Plan for Promoting the Benchmark Rate Reform in 2025," FSC). The goal of this plan is to raise the percentage of KOFR-based interest rate swap transactions relative to total interest rate swap transactions executed between July 2025 and June 2026 to at least 10% and, thereafter, flexibly adjust the target rate upward by about 10%p every year until it reaches 50% by 2030.

100) In the aftermath of the LIBOR scandal in June 2012, major countries underwent reference rate reforms. In Korea, a new law was enacted in 2020, in accordance with the recommendations from the Financial Stability Board (FSB) and other international organizations, entitled "Act on the Management of Financial Benchmarks." In 2021, the KOFR, a risk-free reference rate, was selected as a key benchmark, and its calculation (by the KSD) began during the same year.

swaps (OIS).[101] Central counterparty clearing of KOFR OIS will begin in 2025 after necessary regulatory amendments and the development of a clearing system.

Korea Securities Depository

In June 2024, the KSD started offering omnibus accounts as part of an effort to facilitate overseas investment in Korean government bonds. Omnibus accounts are opened by international central securities depositories (ICSDs). As an omnibus account allows investors to invest in Korean government bonds and other government securities[102] without having to appoint a separate custodian, it has made it significantly easier and more convenient to trade and manage assets. The liquidity and usability of Korean government bonds for foreign investors have also dramatically increased as they can now be bought and sold offshore as well as pledged as collateral via ICSDs. In October 2024, FTSE Russell announced the decision to include Korean government bonds in the World Government Bond Index (WGBI).[103] This decision came amid marked improvements in Korea's tax regime and its foreign exchange and capital market systems, and the rollout of new infrastructure that enhanced foreign investors' access to its government bond market. In particular, the offering of omnibus accounts was mentioned by FTSE Russell as a key factor that influenced its decision in favor of including Korean bonds in the WGBI.[104]

In May 2024, to ensure efficient operation of the registration process for individual investors in government bonds,[105] the KSD established a dedicated processing system.

Meanwhile, system updates were carried out in collaboration with domestic financial investment companies and custody service providers to align the KSD's processes with the shortened settlement cycle in the U.S. securities markets (from T+2 to T+1, effective May 28, 2024).[106] Operating hours were adjusted to facilitate a smooth transition to the new settlement cycle, and support measures were implemented to ensure that domestic investors could settle foreign securities seamlessly.

Ahead of the launch of ATS,[107] the KSD also conducted an extensive overhaul of its clearing and settlement system for the stock market. It plans to continuously enhance the system's capacity to meet the clearing and settlement needs for multiple ATSs.

101) Interest rate swaps using overnight reference rates.

102) These include Korean government bonds issued pursuant to Article 5, Paragraph 1 of the State Bond Act and Monetary Stabilization Bonds pursuant to the Bank of Korea Monetary Stabilization Bond Act.

103) The actual inclusion is scheduled for April 2026.

104) For further details, see "Fixed Income Country Classification Announcement" (FTSE Russell, October 2024).

105) A new type of government bonds was introduced in June 2024 to diversify demand for government bonds and support individual investors in building reliable, long-term assets.

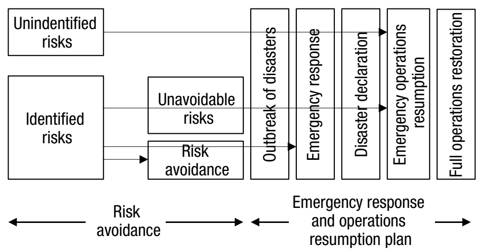
106) For more information, see "SEC Finalizes Rules to Reduce Risks in Clearance and Settlement" (U.S. Securities and Exchange Commission, February 2023).

107) For a detailed discussion, see "Box III-1. Establishment of Alternative Trading Systems (ATS) and Impacts."

Efforts to Strengthen Business Continuity in BOK-Wire+

To prevent the disruption of normal operations of BOK-Wire+ resulting from disasters[108] and to ensure the continuity of critical services even when damage[109] has occurred, the BOK is continuously updating and improving the "BOK-Wire+ Business Continuity Plan." The business continuity plan was first established in 1999 ("BOK-Wire Emergency Plan"). In 2005, this plan was comprehensively revised to its current form, which sets out both preventive measures against identified risks and procedures for efficiently responding to an emergency situation according to the severity of damage. Consistent efforts have been made over the years to ensure business continuity in BOK-Wire+.

Figure III-1. Diagram of business continuity plan



Source: Bank of Korea.

The BOK-Wire+ Business Continuity Plan consists of two key parts: 1) risk avoidance to establish preventive measures against identified risks, and 2) emergency response and operations resumption plan to appropriately respond to material damage and human resource losses according to their severity. Emergencies for material damage arising from technical failures, natural, or social disasters are classified into seven categories based on severity. In light of recent outbreaks of novel infectious diseases, human resource losses resulting from natural or social disasters have also been classified into five categories according to severity.

Table III-3. Classification of emergencies

	Category	Description
Material damage	I	Issues affecting participants'devices, servers, or communication lines
	II	Issues affecting BOK-Wire+'s interfacing devices
	III	Disruption of BOK servers
	IV	System outage affecting the BOK's main IT center: failover to a recovery site
	V	System outage affecting both the main IT center and the recovery site: fallback to manual mode
	VI	Damage at the BOK's head office: relocation of businesses to alternative site I
	VII	Damage at the head office and the main IT center: relocation of businesses to alternative site II and failover to the recovery site
Human resource losses	A	A small number of employees (less than 20% of total staff) found unable to perform their duties
	B	A significant number of employees (20-50% of total staff) found unable to perform their duties
	C	A substantial number of employees (50-75% of total staff) found unable to perform their duties
	D	A majority of employees (75% or more of total employees) found unable to perform their duties
	E	Material damage and human resource losses

To improve the emergency response capabilities of payment and settlement staff of the BOK and participating institutions as well as to enhance its business continuity plan, the BOK regularly conducts a variety of drills. The

108) Here, disasters mean the cause of risks that can lead to a significant loss of life, bodily harm, and destruction of wealth and cause a serious disruption of the functioning of the nation, including natural disasters, social disasters, and technical failures.

109) Damage means losses caused by a disaster, including material damage and human resource losses.

mock drills are either organized by the BOK's Payment and Settlement Systems Department or the IT Department. They include switching to an alternative mode of connecting to the systems of institutions participating or accessing BOK-Wire+, switching to their backup systems, assisting with data entry for units that are impacted, manual mode, and relocation of businesses to alternative sites, depending on the material damage scenario. For human resource losses, drills for the assignment and deployment of substitute workers are conducted by the Payment and Settlement Systems Department.

In recent years, as the result of continued technological advancement, the interdependencies between payment systems has massively risen with more financial institutions participating in several payment systems at the same time. At the same time, the volume of transactions is becoming more concentrated among only a handful of major participants. As a result, there is a real risk of contagion of stress whereby localized shocks in some systems are amplified and propagated through other systems. In tandem, the growing complexity of IT and the increasing sophistication of cyberattacks,[110)] which heightens IT operational risk, have magnified the importance of strengthening cyber resilience to ensure the continuous operation of IT infrastructure.

In the face of the widespread influence of IT on the overall financial system, the BOK is closely cooperating and responding with all related institutions to bolster its resilience. As part of this effort, in 2024, the BOK updated the process for the verification of transaction data consistency between it and BOK-Wire+ participants. Data consistency is vital for the ability to quickly resume businesses when system failures at the head office or the IT center make failover to a recovery site necessary. In addition, coordination with operators of key payment and settlement systems has been continuously improved by, for example, increasing consistency between the business continuity plans (BCPs) of respective institutions and conducting joint BCP drills on a regular basis to guarantee the stable operation of the overall payment and settlement system.

110) Amid the emergence of AI and cloud computing as the main engine driving the modernization of financial services, there are more cases where a financial institution leverages AI for their internal processes or utilizes AI capabilities provided through third-party services. The increased use of AI constitutes a growing source of uncertainty for financial market infrastructures (FMIs) as its impacts are difficult to predict. Moreover, the widespread adoption of cloud computing and related services can drive up the risk of the propagation of cyberattacks from the systems of companies that are directly affected to other interconnected systems. As FMIs today have to contend with threats from a complex network of relationships, whose sources are not easy to pinpoint, efforts are currently underway, led by the BIS CPMI, to better identify cyber and third party service provider-risks and strengthen resilience.

2. Innovation in Payment and Settlement Systems and Expansion of Infrastructure

RTGS-Based Fast Payment System

To eliminate credit risk inherent in deferred net settlement (DNS)-based fast payment systems,[111] to promote financial stability by reducing collateral burdens on participants, and to align with the paradigm shift in the international community toward real-time gross settlement (RTGS) of retail payments,[112] the BOK has initiated a project to implement an RTGS-based fast payment system.

Research on the Implementation of an RTGS-Based Fast Payment System

Case studies were conducted on RTGS-based fast payment systems of major countries. As part of these studies, a visit was made to the Bank of Italy in 2024, the operator of the European Central Bank (ECB)'s TARGET Instant Payment Settlement (TIPS),[113] to learn about its experience of building and operating an RTGS-based fast payment system.[114] The case studies found that RTGS systems in many countries are open to broad categories of participants, have flexible access regime, and have diversified channels for participation. Moreover, mechanisms for supplying settlement liquidity to participants are in place and these mechanisms are designed to reflect the unique payment and settlement environment of each country. As the RTGS-based fast payment systems operate around the clock and year-round in most countries,[115] a separate settlement liquidity facility is also provided for nights and holidays.

In terms of technical aspects, the ECB's TIPS and the U.S. Federal Reserve's FedNow are leveraging the latest technological innovations, such as Application Programming Interface (API), cloud computing, and in-memory and distributed computing,[116] to optimize the operation of their RTGS-based fast payment systems and increase their resilience and capacities.

111) A fast payment system is a system where payment orders are originated and cleared in real time. Fast payment systems are typically available around the clock, every day of the year. Several such systems are in service in Korea, including the Electronic Banking System (2001), the CD/ATM System (2004), and the Open Banking System (2016), all of which are DNS-based systems where the settlement of interbank obligations occurs on a deferred basis in the form of net settlement.

112) The BIS has noted that a paradigm shift is underway in fast payment systems worldwide where RTGS is becoming the preferred settlement arrangement. For further information, see "Developments in Retail Fast Payments and Implications for RTGS Systems" (BIS, December 2021).

113) The ECB's TIPS is a fast payment system connected to Trans-European Automated Real-time Gross Settlement Express Transfer (TARGET) system, processing instant funds transfers in real time.

114) Under a bilateral MOU signed in 2023, the BOK and the Bank of Italy have been sharing knowledge and know-how on payment and settlement systems and innovative information technologies.

115) Seven countries and regions were studied, including the eurozone (TIPS, 2018), Australia (NPP, 2018), Hong Kong (FPS, 2018), Hungary (GIROInst, 2020), Brazil (PIX, 2020), Sweden (RIX-INST, 2022), and the U.S. (FedNow, 2023).

116) API is a set of protocols that enables communication and exchange of data between different applications, thereby improving data access and usability. Cloud computing is a technology that delivers IT services using virtualized resources. In-memory computing is a software architecture that allows data to be kept in memory rather than traditional disk storage. Distributed computing refers to a technology in which computational tasks are executed by dividing them into multiple segments and distributing them across several nodes or servers.

Figure III-2. Annual seminar with the Bank of Italy (June 12-14, 2024)

Source: Bank of Korea.

Exploration of Optimal Implementation Methods

Based on the insights emerging from research carried out so far and the input of relevant institutions, financial institutions, and academics and researchers, the BOK will determine the best approach to the implementation of an RTGS-based fast payment system. Given that an RTGS-based system eliminates credit risk, the BOK will actively explore various ways of supporting private sector-driven innovation in payment and settlement systems by, for instance, adopting an open and flexible access regime that will allow tiered participation by non-bank financial institutions. Meanwhile, as the new system will increase burdens associated with the management of settlement liquidity for participants, the BOK will look into mechanisms to ease liquidity strains, including those that supply intraday liquidity to direct participants. Finally, by drawing from the system architectures adopted by the ECB and the U.S. Federal Reserve, the BOK will also consider leveraging the latest technologies, such as API, cloud computing, and in-memory and distributed computing.

Adoption of ISO 20022

Background to the Adoption of ISO 20022

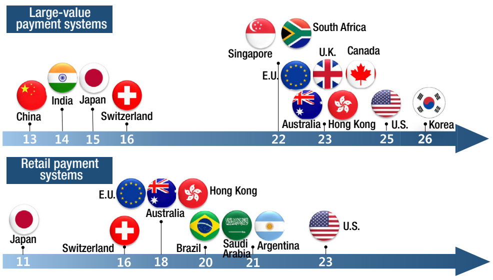
Amid the increase in remittances due to the expanding volume of global trade and the rise in migrant workers, the need to enhance efficiency of cross-border payments emerged as an issue at the forefront of the international agenda. In February 2020, during the G20 Finance Ministers and Central Bank Governors Meeting, inefficiencies plaguing cross-border payments were highlighted, including slow speed, high cost, and limited access. As a result, "enhancing cross-border payments" was set as a G20 top priority. Subsequently, the G20 Roadmap for Enhancing Cross-Border Payments was developed by the FSB in collaboration with the Bank for International Settlements (BIS) and other international organizations.[117)]

The adoption of ISO 20022 is one of the key tasks under the G20 Roadmap for Enhancing Cross-Border Payments. Many major economies have already implemented ISO 20022 or are in the process of doing so. ISO 20022 pro-

117) 19 tasks ("building blocks") were selected including application of anti-money laundering rules, increased adoption of payment-versus-payment (PvP) in foreign exchange transactions, interlinking of national payment systems, and adoption of a harmonized ISO 20022 version. For a detailed discussion, see "Challenges Facing Cross-Border Payment Services and Highlights of the G20 Roadmap" in "2. Domestic Implementation of the G20 Roadmap for Enhancing Cross-Border Payments" under "IV. Analysis of Key Payment and Settlement Issues."

vides a standardized message format[118] and a flexible and extensible framework that can significantly enhance technical compatibility and processing efficiency. The implementation of ISO 20022 is likely to result in tremendous gains in the efficiency of interlinking payment infrastructures across borders and is also expected to improve coordination between international trade operations and financial operations by companies. Meanwhile, as this message format allows users to specify more comprehensive information about the originator and beneficiary, it will facilitate more efficient compliance verification with global regulations related to international transfers, including anti-money laundering (AML) and countering the financing of terrorism (CFT) requirements.

Figure III-3. Adoption of ISO 20022 by BIS CPMI member jurisdictions[1)]



Note: 1) Adopted by 25 out of 27 total member jurisdictions for large-value and retail payment infrastructures (including scheduled adoptions).
Sources: BIS CPMI, central banks of each country.

Progress and Future Plans for Implementation of ISO 20022 in BOK-Wire+

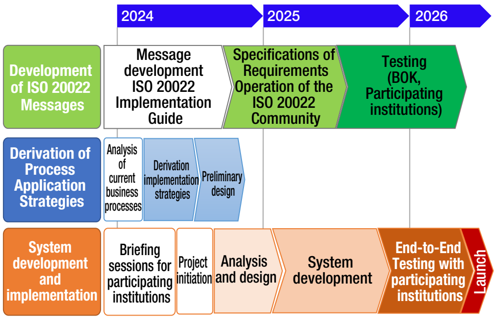
To keep abreast of international trends in financial messaging, the BOK has decided to adopt the ISO 20022 framework in its large-value payment system, BOK-Wire+. In 2022, the "Basic Plan for the Adoption of ISO 20022 in BOK-Wire+" was established, and the development of ISO 20022 Messages began with the objective of initially applying the new standard to core funds transfer processes in BOK-Wire+.[119] In 2023, the first phase of development came to a conclusion. In 2024, to reflect harmonised ISO 20022 data requirements recommended by the BIS Committee on Payments and Market Infrastructures (CPMI),[120] additional messages were developed and existing messages were revised. In total, 29 messages were developed, along with an implementation guide for BOK-Wire+ participants.

In October 2024, the BOK initiated the system integration process in preparation for updating its internal systems. During 2025, the BOK will proceed to update its internal systems and participants will begin system development activities in response. Tests will also be conducted in 2025 to verify the interconnection between BOK-Wire+ and participants' systems, and to

118) Financial messages are structured messages that adhere to specific formats and standards and that communicate information needed to complete a financial transaction, such as the date and value of a transaction and information about financial institutions.
119) The current aim is to apply the new messaging standard to core funds transfers, including general funds transfers, beneficiary-designated transfers, CLS settlements, and the associated cash reporting and administrative messages. Any messages related to call transactions and delivery-versus-payment (DvP) transactions will be considered once the implementation for core funds transfers is completed.
120) Although significant progress has been made in the adoption of the ISO 20022 framework, issues, such as inconsistent message formats across countries and non-compliance with mandatory data requirements, have been identified. These challenges are mainly due to national differences in the payment and settlement environment and payment processing methods. To address them, in October 2023, the BIS CPMI issued harmonised ISO 20022 data requirements and expects jurisdictions to incorporate these requirements into their implementation of ISO 20022 by the end of 2027.

ensure the functionality of the newly developed messages. Provided that all preparatory steps, including the final test, are completed on time, the new ISO 20022-based BOK-Wire+ will launch in the second quarter of 2026.

Figure III-4. Timeline of the implementation of ISO 20022 in BOK-Wire+



Source: Bank of Korea.

Since the adoption of ISO 20022 in BOK-Wire+ involves renewal of not only the BOK's own systems, but also those of the participants, close communication and cooperation between the two sides are essential. To ensure the efficient exchange of information and feedback, the BOK operates communication channels such as an ISO 20022 task force and a working group. Moreover, active efforts are being made to educate participants on the details of the messaging standard and the required system renewals, both through dedicated information sessions and business consultations with individual institutions. Participants share with the BOK their progress in renewing their systems and any issues encountered. The newly developed ISO 20022 Messages and the Implementation Guide for participants are published on the BOK website and SWIFT's MyStandards, a platform for managing ISO 20022 Messages. Given the complexity of the tasks involved in adjusting to BOK-Wire+'s transition to the new standard, the BOK also provides message samples for different use cases[121)] in order to assist the staff of participant institutions in renewing their systems, as well as validation rule files listing rules that must be observed for the proper reception of messages sent to BOK-Wire+.

The purpose of adopting ISO 20022 is to create the technical and institutional environment necessary to facilitate the efficient interlinking of payment systems across borders. Therefore, it is important to closely monitor international discussions on ISO 20022 and remain informed of the latest developments so as to respond appropriately. In June 2024, the BOK became a member of High Value Payments Systems Plus (HVPS+), a global initiative focused on promoting the adoption and use of ISO 20022 in large-value payment infrastructures. The BOK plans to actively communicate its position within HVPS+ and promptly reflect changes to ISO 20022 in its implementation process to drive the project toward the best possible outcome.

121) 43 scenarios in which BOK-Wire+ ISO 20022 Messages can be used and 121 examples of actual messages for these scenarios have been provided.

3. Strengthening International Cooperation in Payment and Settlement Systems

Participation in the Global Dialogues on Enhancing Cross-Border Payments

The BOK actively participates in multilateral discussions aimed at improving cross-border payments.

In 2024, the BIS CPMI held in-depth discussions of central banks around the world on measures to enhance cross-border payments. Topics included governance structures and oversight mechanisms that would be required if fast payment systems were to be interlinked across borders, efforts to promote the standardization of APIs, and the development of tokenization frameworks. Based on the outcomes of these discussions, the BIS CPMI published a series of reports.[122] The BIS CPMI also published a joint report with the FSB on the progress of the G20 Roadmap and conducted consultations with member central banks to discuss the way forward.

At the SWIFT International Banking Operations Seminar (SIBOS), hosted by SWIFT, discussions took place on the theme of challenges and opportunities presented by digital transition. During these discussions, the participants exchanged views on the future of finance that will be shaped by new technologies, such as AI, digital currency, and tokenization. The BOK took an active part in SIBOS roundtable sessions, sharing Korea's progress in adopting ISO 20022 and reporting on how Korean financial institutions use SWIFT Global Payment Innovation (GPI) services[123] to improve the delivery of cross-border payments.

Going forward, the BOK will further enhance cooperation on cross-border payments with international organizations and peer central banks. It will also closely monitor global discussions on related issues and continue efforts to improve cross-border payment services provided by domestic institutions.

Stepping Up Cooperation with Major Central Banks

At the Executives' Meeting of East Asia Pacific Central Banks (EMEAP) Working Group on Payments and Market Infrastructures (WGPMI), member central banks shared updates on payment and settlement systems, including legal and institutional reforms and findings from digital currency research. The BOK introduced the current domestic debate on vir-

122) In 2024, the BIS CPMI published various reports and documents on issues relevant to the enhancement of cross-border payments, including “Linking Fast Payment Systems Across Borders: Governance and Oversight” (October 2024), “Promoting the Harmonisation of Application Programming Interfaces to Enhance Cross-Border Payments: Recommendation and Toolkit” (October 2024), and “Tokenisation in the Context of Money and Other Assets: Concepts and Implications for Central Banks” (October 2024).

123) International transfers provided by SWIFT GPI are not only faster than traditional payment services, but also offer end-to-end traceability, allowing customers to track their progress in real time. SWIFT GPI is currently used by nearly 4,500 banks worldwide, including domestic foreign exchange banks, for cross-border payments.

tual asset regulation and shared Korea’s recent developments in cross-border payments with other regional central banks.

The BOK also attended a payment and settlement conference jointly hosted by the South East Asian Central Banks (SEACEN) and the BIS CPMI, where it introduced recent trends in digital currencies and Korea’s ongoing policy initiatives. During the conference, the BOK also presented the outcomes of Project Mandala,[124] in which it participated.

Looking ahead, the BOK will further strengthen cooperation with major central banks and will continue to actively engage in global dialogues. In 2025, the BOK plans to take the lead in fostering cooperation among regional central banks, notably, by hosting the EMEAP WGPMI in Seoul.

124) For further details, see “Box IV-1. Outcome of Project Mandala.”

Box III-1.

Establishment of an Alternative Trading System (ATS) and Impacts

Background and Current Status

In August 2013, the Financial Investment Services and Capital Markets Act was amended to authorize the establishment of ATSs,[125] with the aim of improving access to capital markets by diversifying securities market infrastructure and making trading more convenient for investors. Until recently, there had been no concrete attempts to establish an ATS due to cumbersome regulations, rendering these enterprises less than attractive in terms of profitability.[126] However, after the COVID-19 pandemic and amid a surge in stock trading volumes, interest in an ATS was rekindled. In February 2025, Nextrade Co., Ltd.[127] became the first company to be approved for an ATS license. The ATS by Nextrade was launched on March 4, 2025.

Trading Mechanism of the ATS

Unless otherwise instructed by an investor, financial investment companies route investor trade orders[128] to a trading platform that is deemed most advantageous[129] based on the comparison of prices between the KRX and the ATS and the likelihood of fulfillment. As for the ATS, its role is limited to the execution of trades according to the order it receives. The ATS transmits details of an executed trade to the KRX in real time. The KRX then clears and settles the transaction on a consolidated basis per clearing member (financial investment companies, etc.). Having a separate clearing house[130] to handle clearing and settlement is also a standard practice in countries where ATSs had been in operation already for some time.

125) An ATS refers to a trading infrastructure performing functions related to securities transactions, such as buying and selling and brokering transactions, but not those related to the listing of securities. Because of this, an ATS is subject to more lax regulations compared to regular exchanges. An ATS is defined under Paragraph 5 of Article 8-2 of the Financial Investment Services and Capital Markets Act.

126) Prior to the June 2016 amendment to the Enforcement Decree of the Financial Investment Services and Capital Markets Act, the daily average volume of transactions conducted on ATSs could not exceed 5% of total securities transactions executed across all segments of the securities market.

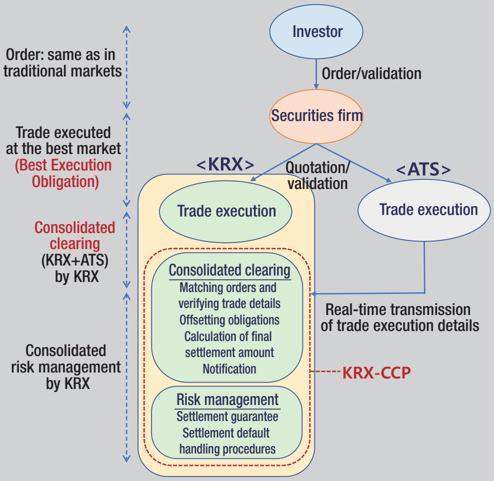
127) Nextrade was incorporated in November 2022. With paid-in capital standing at KRW 146.1 billion as of the end of March 2025, the list of its 34 shareholders includes the Korea Financial Investment Association and several financial investment companies.

128) Financial investment companies operate a Smart Order Routing System that automatically routes trade orders to the best market.

129) Under Article 68 (Best Execution Obligation) of the Financial Investment Services and Capital Markets Act, a financial investment company has the duty to seek the best execution. In other words, financial investment companies are required to use reasonable diligence to identify and obtain the best possible terms for customers' trades.

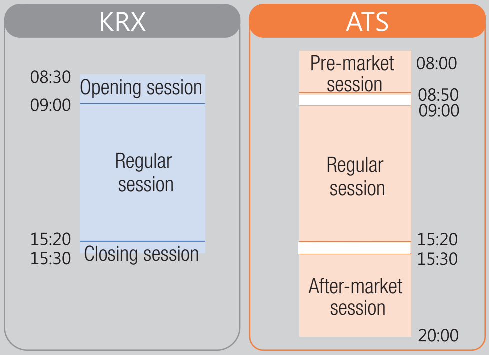
130) In the U.S., trades executed on ATS are cleared and settled through the Depository Trust & Clearing Corporation (DTCC). In Japan, the Japan Securities Clearing Corporation (JSCC) is responsible for the clearing of ATS trades and the Japan Securities Depository Center (JASDEC) for their settlement. In Europe, ATS trades are likewise cleared through an independent clearing house and then settled by the central securities depository of respective countries.

ATS trading flowchart



Source: KRX.

Extension of trading hours in connection with the introduction of ATS



Source: FSC.

Key Characteristics of the ATS and Expected Benefits

Compared to the KRX, the ATS has several distinctive features, which include 1) extended trading hours (08:00-20:00), 2) lower trading fees and commissions (20-40%), 3) more varied order types (mid-price order, stop-limit order), and 4) a limited range of assets that can be traded (about 800 KRX-listed stocks and depository receipts (DRs)). However, during pre-market and after-market sessions, when liquidity is typically thin, only limit orders (including immediately executable limit orders and best limit orders) are allowed. The government is currently looking to amend regulations to extend the range of securities that can be traded through an ATS by adding exchange-traded funds (ETFs) and exchange-traded notes (ETNs).

The market expects the introduction of ATSs to yield several key benefits including 1) gains in market efficiency from the lower cost of trading, 2) greater convenience for investors from extended trading hours, and 3) expansion of capital markets from the increased inflows of capital into securities. However, these benefits won’t come without some downsides. For one, if low trading fees charged by ATSs encourage high-frequency trading (HFT),[131] this could increase the likelihood of flash crashes, resulting in high volatility in the stock market.

Impact on the Clearing and Settlement System

As the role of an ATS is limited to the execution of trades, it does not accumulate settlement resources. Moreover, as securities traded on an ATS can also be traded at the KRX and are cleared and settled by the latter, the introduction of ATSs has no impact on the KRX’s required settlement resources[132] for default handling.

131) A type of algorithmic trading that seeks to profit from small differences in prices by placing, amending, canceling, and executing a large number of orders in fractions of a second (milliseconds).

On the other hand, as securities trading systems were recently updated to allow interaction with the ATS's, this could result in some system errors. Therefore, the KRX and other relevant institutions may need to increase their monitoring and make additional efforts to reduce operational risk.

132) In order to respond to the settlement failure or the default of a member, the CCP of the KRX utilizes settlement resources, such as member margins, intraday add-on margins, and the joint compensation funds of clearing members.

Ⅳ

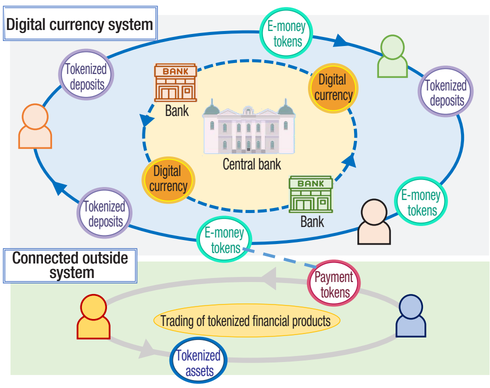
Analysis of Key Payment and Settlement Issues

1. Deepening Digital Currency Research

Project Hangang

In 2024, the BOK took an essential step in its "Project Hangang"[133] by developing a digital currency system based on digital currency to support various forms of private digital currencies, such as tokenized deposits. The BOK has also been preparing, in collaboration with the government, for a pilot in the first half of 2025 that will allow the general public to participate, use tokenized deposits, and to gain firsthand experience of the benefits offered by digital currencies, such as digital vouchers.

Figure IV-1. Digital currency system diagram (tentative)[1]



Note: 1) A system built around a digital currency issued by a central bank, where a variety of private digital currencies, including tokenized deposits issued by banks, e-money tokens which can also be issued by non-bank institutions, and payment tokens issued by connected outside system all circulate side by side.

Source: Bank of Korea.

Table IV-1. Types and characteristics of digital money[1]

Type	Characteristics
Digital currency	Issued to financial institutions for use in inter-institutional transactions and final settlements
Tokenized deposits	A form of digital money similar in nature to bank deposits, issued by banks using tokenization technology
E-money tokens[2]	A form of digital money, also issuable by non-bank institutions, backed by digital currency as a reserve asset
Payment tokens[2]	A form of digital money that is issued on outside system connected to the digital currency system and used for settlement in tokenized asset transactions

Notes: 1) Types and characteristics of digital monies that may be issued within the BOK's digital currency system.

2) These tokens are analogous to stablecoins in that they are 1) based on distributed ledger technology and 2) fully backed by reserve assets.

Source: Bank of Korea.

In the Enforcement Decree of the Act on the Protection of Virtual Asset Users, which entered into force on July 19, 2024, the government excluded tokenized deposits from asset types that are considered virtual assets and designated seven banks (KB Kookmin Bank, NongHyup Bank, the Industrial Bank of Korea, BNK Busan Bank, Shinhan Bank, Woori Bank, and Hana Bank) as innovative financial service providers,[134] authorizing them to handle tokenized deposits. In November 2024, the BOK signed an MOU with the Ministry of Science and ICT (MSIT) and with the Financial Services Commission (FSC) to cooperate on the "Digital Financial Service Demonstration" project. A "Digital Voucher Management Platform" was also developed in 2024 in collaboration with the MSIT and the Korea Internet & Security Agency.

133) For further information, see the press release "BOK, FSC, and FSS, in Cooperation with the BIS, Have Launched a Project to Explore a Future Monetary System for Korea" (BOK, FSC, and FSS, October 2023).

134) Banks designated as "innovative financial service providers" (FSC, October 30, 2024) are authorized to issue tokenized deposits as part of their business operations, and regulatory exemptions are granted to allow depositor protection to apply to users of tokenized deposits.

Figure IV-2. MOU signing between the Ministry of Science and ICT, the FSC, and the BOK (November 6, 2024)

Source: Bank of Korea.

To allow participants in the pilot to use tokenized deposits in a variety of environments, the BOK secured various types of partner merchants, including convenience stores, large retail outlets, bookstores, coffee shops, and delivery apps. Meanwhile, to test digital vouchers in a real-world setting, digital voucher programs will be operated in cooperation with Seoul Metropolitan City, Daegu Metropolitan City, and Silla University, targeting areas such as the youth, cultural activities, child-rearing, and child care. This project will assess the feasibility of conveniently managing and using multiple types of vouchers within a single digital wallet by leveraging the programmability of tokenized deposits. It will also test whether real-time payments and the conditional payment functions of digital vouchers can help simplify complex settlement processes and prevent fraudulent claims.

Figure IV-3. Tokenized deposit partner merchants

Sources: Bank of Korea., websites of respective merchants.

Table IV-2. Digital voucher program

	Category	Description
Seoul Metropolitan City	Youth and cultural activities	Target group: those earning less than 150% of the median income, aged 20-23 Eligible uses: attendance at performing arts, such as plays or dance performances
Daegu Metropolitan City	Child-rearing and childcare	Target group: parents of young children who signed up with Dadaegu, a local government service platform Eligible uses: purchases at childcare supply stores
Silla University	Youth	Target group: newly-enrolled Silla University students Eligible uses: purchases made on campus or at nearby local stores

Source: Bank of Korea.

A real-world experiment is scheduled to take place from April to the end of June 2025. Prior to the launch, a thorough joint review of user protection measures, including personal data protection and cybersecurity,[135)] is conducted in cooperation with relevent authorities, such as the FSC and the Financial Supervisory Service (FSS), and participants are subsequently recruited.

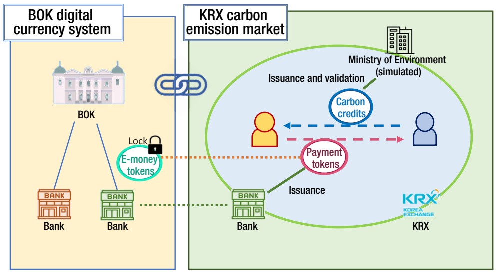
During the fourth quarter of 2024, technical experiments in a virtual environment were conducted in collaboration with the Korea

135) The Financial Security Institute and external security firms jointly inspected all applied programs and infrastructure of the digital currency system.

Exchange (KRX) and the Korea Financial Telecommunications and Clearings Institute (KFTC) to assess whether the digital currency system could support efficient and safe transactions of digital assets, including tokenized financial products.

As part of the technical experiments conducted with the KRX, a mock carbon emission trading system based on distributed ledger technology was connected to the BOK's digital currency system. The experiment confirmed that the transfer of tokenized payment instruments, issued based on the digital currency, and the transfer of tokenized carbon credits can occur simultaneously.

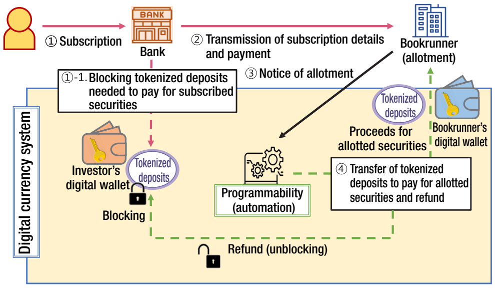
Figure IV-4. Scenario testing carbon credit circulation (jointly conducted with the KRX)



Source: Bank of Korea.

The technical experiments carried out with the KFTC tested functions related to the subscription of tokenized bonds by individual investors, such as green bonds and sustainability-linked bonds (SLBs). These technical experiments demonstrated that settlement risk can be effectively managed without actual transfers of large sums of funds by using the digital currency system's programmability to block tokenized deposits corresponding to the subscription amount.[136)]

Figure IV-5. Scenario testing the issuance of tokenized securities to general investors (jointly conducted with the KFTC)



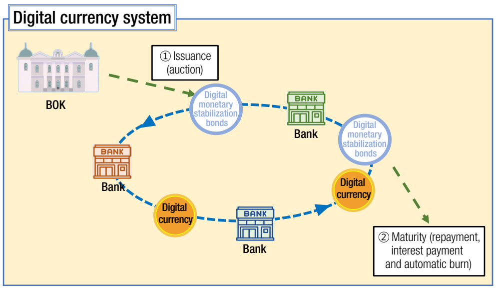
Source: Bank of Korea.

The BOK also conducted technical experiments of the issuance of tokenized deposits to financial institutions. In these experiments, mock tokenized securities created within the BOK digital currency system were issued through a competitive auction to financial institutions, subsequently traded among them, and automatically redeemed and burned upon maturity following the payment of principal and interest. The experiment confirmed that a digital currency can be used as a settlement

136) Currently, large transfers of investor funds occur throughout the IPO subscription process, including 1) the submission of subscription deposits to a bookrunner by investors, 2) the management of IPO subscription deposits by the bookrunner, and 3) the refund of payments for unsuccessful IPO applications. In these experiments, 1) tokenized deposits equivalent to the subscription amount were blocked for each individual investor, 2) this information was transmitted to a bookrunner, and 3) the bookrunner allocated tokenized securities to investors without receiving any actual funds transfers. As a result, only the value of the actually allotted shares was transferred, minimizing unnecessary funds movements while mitigating settlement risk.

asset for tokenized securities both at the issuance and circulation stages, and that the payments of principal and interest can be automated using the programmability embedded in the securities.

Figure IV-6. Scenario testing the issuance of tokenized securities to financial institutions



Source: Bank of Korea.

Agorá and Other Projects to Enhance Cross-Border Payments

Digital currency research is currently underway at 91 central banks around the world,[137] and they are using the results of these endeavors to support their various efforts to enhance cross-border payments. The BOK has participated in several joint research projects with peer central banks that aim to improve cross-border payment services using digital currency technology.

In April 2024, the BOK announced its participation in Project Agorá, which is conducted jointly with the Bank for International Settlements (BIS), the Institute of International Finance (IIF), and a group of central banks including those from five major currencies (the U.S., France (representing the euro area), the U.K., Japan, Switzerland, and Mexico). Project Agorá explores the possibility of advancing the monetary system through the use of tokenized central bank money and commercial bank deposits. The current priority in this project is to research ways to increase the speed and transparency of cross-border payment services and to lower costs. In September 2024, some 40 private-sector institutions were selected to join Project Agorá, including six Korean banks (KB Kookmin Bank, NongHyup Bank, the Industrial Bank of Korea, Shinhan Bank, Woori Bank, and Hana Bank). The fact that Korea has participated in this global initiative transcending geographic boundaries and accommodating diverse economic blocs since its inception stage is of tremendous significance. As this is a joint project with global banks, it also presents a unique opportunity for domestic banks to develop their global competitiveness.

In October 2024, Project Mandala, jointly carried out with the BIS Innovation Hub Centre in Singapore and four central banks (Korea, Australia, Malaysia, and Singapore), drew to a successful conclusion and the final project report was submitted. The goal of Project Mandala was to enhance efficiency of cross-border payment services by reducing burdens associated with regulatory compliance checks[138]

137) For further details, see "Rise of the Central Bank Digital Currencies: Update as of 1 March 2024" (BIS, March 2024).

138) Financial institutions providing cross-border payment services are required to verify the compliance of each transaction with the relevant country's capital flow management (CFM) policy and anti-money laundering (AML) and countering the financing of terrorism (CFT) rules.

for financial institutions. The research and tests conducted under this project demonstrated that a system automating compliance assurance processes can eliminate duplicative checks by banks in the funds transfer flow, thereby increasing the speed and transparency of cross-border payments.[139)]

Research into Privacy-Enhancing Technologies

The BOK conducted research into two types of technologies with the potential to enhance protection of personal data associated with digital currencies over the medium- to long-term horizon. First, research was carried out into the zero-knowledge proof (ZKP) protocol[140)] to assess whether this technology can help assure regulatory compliance without putting personal data protection at risk. The results confirmed that by using ZKPs it was possible to establish the compliance of an individual transaction with anti-money laundering (AML) and countering the financing of terrorism (CFT) regulations based on the sender's and recipient's risk score, without revealing their personal data to financial institutions. Next, homomorphic encryption (HE)[141)] was tested to determine whether this technique can support users' data right to select financial information they will share with a service provider. The test was configured so that users' wallets were assigned a one-time address for each transaction and the transaction value was encrypted using HE to make it only visible to the sender and recipient. The result showed that it was possible for users to control the information that financial institutions share with third-party service providers.

In September 2024, the BOK co-hosted the "Privacy Enhancing Technologies Forum" with the Personal Information Protection Commission, on the theme of "Exploring Privacy-Enhancing Technologies to Protect Personal Data in Digital Currency System." During this forum, the BOK presented the results of its research into technological solutions to protect the personal data of digital currency users and concurred with participants from academia, industry, and the research community on the importance of data privacy in a digital currency system.

Figure IV-7. Privacy Enhancing Technologies Forum co-hosted by the BOK and Personal Information Protection Commission (September 24, 2024)

Source: Bank of Korea.

139) For further details, see "Box IV-1. Outcome of Project Mandala."

140) A cryptographic technique to prove knowledge of a secret without revealing the secret itself.

141) A cryptographic technique that allows computations to be performed on encrypted data without decryption, producing results identical to those obtained from computations in the original plain text.

2. Domestic Implementation of the G20 Roadmap for Enhancing Cross-Border Payments

Background

Amid expanding global trade and a rise in migrant labor, the need to enhance efficiency of cross-border payments[142)] has emerged as a major issue in the international community. In February 2020, during the G20 Finance Ministers and Central Bank Governors Meeting, attention was brought to inefficiencies in cross-border payment services, such as slow speed, high cost, and limited access. "Enhancing cross-border payments" was set as a priority for the G20 during this meeting and requests were made to international organizations to identify and select actions needed to advance this goal. The BIS and the Financial Stability Board (FSB) formed a task force ("international task force") and unveiled a comprehensive roadmap ("G20 Roadmap") in October 2020. G20 member countries are currently working toward achieving the targets outlined in the G20 Roadmap over the medium- to long-term horizon of two to five years.

Challenges Facing Cross-Border Payment Services and Highlights of the G20 Roadmap

Traditional cross-border payment services, provided through correspondent banking networks, have long faced inefficiencies, such as slow processing speeds, high costs, limited access, and low transparency. The involvement of one or more intermediaries[143)] slows the speed of international funds transfers considerably compared to domestic transfers and fees charged to end-users are also quite high. Meanwhile, correspondent bank networks have significant entry barriers,[144)] making it difficult for small and mid-sized banks and fintech firms to join them. As a result, few competition-driven improvements in efficiency can be expected in this market. Due to differences in foreign exchange regulations across countries, as well as AML/CFT rules, the processing of cross-border payments has become increasingly complex, resulting in reduced efficiency and transparency in service delivery. Finally, the fact that the operating window of payment and settlement systems providing clearing and final settlement of cross-border payments is limited to the normal business hours of the respective countries is also a major source of friction in terms of payment flow.

In order to address these various issues, the international task force identified 19 tasks (building blocks) across five focus areas and announced the G20 Roadmap setting out an action plan, quantitative targets, and a specific time frame. Concretely, the G20 countries will work toward the goal of reducing the cost of cross-border payment services to less than 1-3% of the amount remitted and shortening the processing time so that most transfers

142) Including international trade payments and remittances between individuals.

143) Typically, correspondent banks.

144) To facilitate cross-border payments, financial institutions must maintain ongoing relationships with global correspondent banks, incuring significant costs for account maintenance and foreign currency funding.

(75% of them) are credited within an hour by making necessary adjustments to their regulatory framework and payment systems. Efforts to improve the regulatory and systems infrastructure are currently underway across member states, in a manner appropriate to their respective financial and economic environments.

Table IV-3. G20 Roadmap and planned actions

5 focus areas	19 building blocks
Public and private sector commitment	Develop common cross-border payments vision and targets
	Implement international guidance and principles (PFMI, etc.)
	Define common features of cross-border payment service levels
Regulatory, supervisory, and oversight frameworks	Align regulatory, supervisory, and oversight frameworks
	Apply AML/CFT consistently and comprehensively
	Review interaction between data frameworks and cross-border payments
	Promote safe payment corridors
	Foster know your customer (KYC) and identity information-sharing
Existing payment infrastructures and arrangements	Facilitate increased adoption of payment-versus-payment (PvP) settlements
	Improve direct access to payment systems
	Explore reciprocal liquidity arrangements
	Extend and align operating hours of large-value payment systems
	Pursue interlinking of payment systems
Data and market practices	Adopt a harmonized version of ISO 20022 for message formats
	Harmonize API protocols for data exchange
	Establish unique identifiers with proxy registries
New payment infrastructures and arrangements	Consider the feasibility of new multilateral platforms and arrangements for cross-border payments
	Foster the soundness of global stablecoins arrangements
	Factor an international dimension into any CBDC designs

Source: Bank of Korea.

Key Planned Actions

Of the 19 building blocks, the BIS Committee on Payment and Market Infrastructures (CPMI) selected the interlinking of national payment systems, the adoption of ISO 20022, and the extension of payment system operating hours as priority actions due to their potential to rapidly reduce costs and to improve the speed of cross-border payments in the short term.

Interlinking Payment Systems Across Borders

Interlinking payment systems across borders means directly connecting major national payment systems between countries to shorten and streamline the cross-border payment process. The goal is to improve the speed and lower the cost of payment services by reducing the involvement of correspondent banks, operating under constraints from differences in time zone and business hours between countries, by directly linking the networks of fast payment systems that are online around the clock in most countries. Until recently, initiatives to link payment systems have only been undertaken between neighboring countries within the same economic bloc with large volumes of trade and remittance flows.[145] However, more recently, projects to link payment systems between different economic blocs have been actively underway. One example is Immediate Cross-Border Payments (IXB), the project to connect the U.S. fast payment sys-

145) Examples include the linkage between the payment and settlement systems of the U.S. Federal Reserve and the Bank of Mexico, that between the fast payment systems of the Monetary Authority of Singapore (MAS) and the Bank of Thailand (BOT), and that between the fast payment systems of the European Central Bank (ECB) and the Sveriges Riksbank.

tem The Clearing House (TCH) and the EU fast payment system EBA Clearing. Moreover, the European Central Bank (ECB) has recently announced a plan to join Project Nexus to link the payment systems of five Asian countries. In response to these innovative activities across the global community, the BOK plans to examine the feasibility of linking its domestic fast payment systems with those of other countries.

Implementation of ISO 20022

The international task force developed global guidelines to promote the adoption of ISO 20022, the common messaging standard for cross-border payment services. This is to ensure the interoperability of cross-border payment instructions by standardizing the data structure and handling of ISO 20022 messages, which will be adopted by SWIFT starting in November 2025. Once ISO 20022 is implemented in SWIFT messages, this is expected to drive up the efficiency of data processing in international financial transactions and cut the cost of regulatory compliance with global AML/CFT rules.

Extensions of Payment System Operating Hours

Major countries are discussing ways to extend the operating hours of their payment and settlement systems. If the operating hours of major payment and settlement systems across countries are aligned to secure overlapping time windows, the processing speed of cross-border payments could be enhanced and costs reduced. For example, if a German firm were to initiate a large-value funds transfer to an Indonesian firm via correspondent banking, the current overlap in the operating hours between the large-value payment systems of the euro area and Indonesia is limited to just six hours a day (06:00-12:00). As a result, such a transaction often remains suspended until the start of the next business day, delaying the payment. According to the BIS, increasing the overlap in operating hours between large-value payment systems could mitigate such delays and interruptions in payment processing.[146)]

Major central banks are continuing to extend the operating hours of their large-value payment systems in response to international efforts to improve cross-border payment services, meet rising demand for faster payments, and strengthen the competitiveness of payment services for their national currencies. In 2024, the U.S. Federal Reserve and the Bank of England (BoE) announced plans to operate their respective large-value payment systems nearly around the clock, seven days a week, all year round.[147)] In particular, the BIS proposed the establishment of a common Global

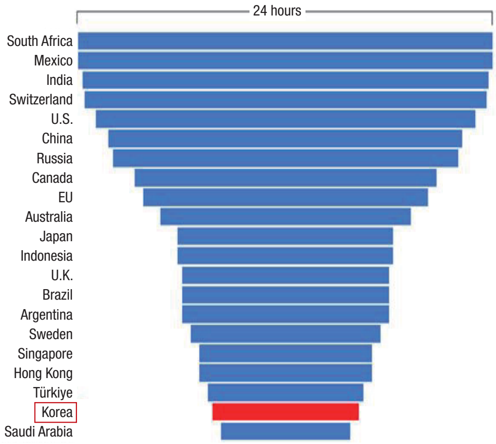
146) For further details, see “Extending and Aligning Payment System Operating Hours for Cross-Border Payments” (BIS, November 2021).

147) The U.S. Federal Reserve has announced plans to extend the operating hours of Fedwire from 22 hours (21:00-19:00 of the following day) on five business days to 22 hours of every day of the week, including weekends and holidays. The BoE has also unveiled plans to extend the operating hours of CHAPS from 12 hours (6:00-18:00) on five business days to 23 hours per day, seven days per week and is currently collecting feedback from the industry.

Settlement Window (06:00-11:00 GMT, 15:00-20:00 in local time in Korea) for settlement by expanding the overlapping hours of national large-value payment systems, in order to support uninterrupted cross-border payment processing.

BOK-Wire+, the large-value payment system in Korea, is open eight hours and 30 minutes per day (9:00-17:30), which places it toward the bottom of the rankings in terms of the length of operating hours among BIS CPMI member states. The BOK plans to proactively assess the necessity of expanding the operating hours of BOK-Wire+, in response to global discussions and developments led by international organizations and major central banks.

Figure IV-8. Operating hours of large-value payment systems among BIS CPMI member states



Sources: BIS (2021), central banks of each country.

Domestic Implementation of the G20 Roadmap

Since 2023, the FSB and the BIS CPMI have annually assessed the progress being made toward the objectives set under the G20 Roadmap and published the results.[148] In June 2023, the BOK formed the "Task Force for the Enhancement of Cross-Border Payments"[149] to track domestic progress on the implementation of the G20 Roadmap and to identify areas that need improvement. The work of this task force so far has indicated that funds transfers by individuals and businesses are generally proceeding smoothly.

The BOK will continue to monitor progress on the implementation of the G20 Roadmap in Korea against the targets set by the international task force, in order to increase the safety and convenience of payment services available to the public.

148) The consolidated progress report for 2024 stated that, despite meaningful progress made on the standardization of ISO 20022 and the application of API in payment and settlement systems in G20 countries, more time and effort were needed in order to achieve the targets of the G20 Roadmap.

149) This task force, led by the BOK, is a public-private consultative body composed of domestic banks, fintech money transfer service providers, and card companies. It was created to examine business processes, transaction speed, and cost structures of domestic payment service providers in relation to the implementation of the G20 Roadmap, and to collect feedback from the industry.

3. Domestic Virtual Asset Market Activity and Regulatory Trends

Overview

In 2024, the domestic virtual asset market experienced massive growth, with its total capitalization surging past KRW 100 trillion, as the approval of spot virtual asset exchange-traded funds (ETFs) in major countries[150) and the entry into force of Markets in Crypto-Assets (MiCA) in the EU[151) reduced regulatory uncertainties and instilled hopes for a more crypto-friendly investment environment.

The rapid expansion of virtual asset markets has sparked a lively debate about their regulation. Given the special characteristics of virtual asset markets whose growth has been chiefly driven by speculative demand from individual investors, the focus in this debate has fallen on the protection of investors and reining in unfair or deceptive acts or practices. As a result, the Act on the Protection of Virtual Asset Users,[152) a new law that sprang from this debate, also provides mainly for the protection of investors' assets and the prohibition of unfair or deceptive practices. This act, which entered into force on July 19, 2024, imposes a series of duties and obligations upon virtual asset service providers, requiring them to take reasonable steps to protect investors' assets and, because of this, is widely considered to have set basic safety guardrails. Nevertheless, there has been an increasing call for a more comprehensive regulatory framework for the virtual asset industry. Active discussions are currently underway, led by financial authorities, on the second phase of legislation[153) to expand on the Act on the Protection of Virtual Asset Users by introducing a new law that provides for all essential aspects of virtual asset markets.

150) The U.S. Securities and Exchange Commission (SEC) approved the listing and trading of spot Bitcoin ETFs in January 2024 and of spot Ethereum ETFs in July 2024. Meanwhile, the Securities and Futures Commission of Hong Kong became the first East Asian securities market authority to approve Bitcoin and Ethereum ETFs in April 2024.

151) In the EU, MiCA, the world's first single piece of legislation regulating crypto-asset markets was passed in June 2023. The portion of this law applying to stablecoins, both asset-referenced tokens (ART) and e-money tokens, entered into force on June 30, 2024. The regulations applying to other utility tokens entered into force later in the same year, on December 30, 2024.

152) The passage of this law was prompted by the urgent need to protect virtual asset investors and to crack down on unfair practices (July 18, 2023). The drafters of this law intended that it would be followed in due time by additional laws, called the "second phase of legislation," so that a comprehensive regulatory framework could be established across the industry.

153) In the wake of a succession of incidents that severely undermined confidence in virtual asset markets and resulted in heavy losses for investors, such as the Terra-Luna crash in May 2022 and the bankruptcy of the U.S. crypto exchange FTX in November 2022, Korea adopted a phased legislative approach in which the minimum regulations necessary to protect virtual asset investors would be first put in place and then other regulations would be gradually added later. At the time of the enactment of the Act on the Protection of Virtual Asset Users, the National Assembly had issued a supplementary opinion stating that the creation of a comprehensive regulatory framework, which would provide for conflicts of interest in the issuance and distribution of virtual assets, regulate stablecoins, and set forth rules for valuation, advisories, and disclosures, would be left to the next legislative session.

Virtual Asset Market Activity[154)]

During 2024, both asset prices and trading volumes rose dramatically in domestic trading platforms for virtual asset markets, bolstered by increased inflows of money following the approval of spot virtual asset ETFs in the U.S. and Hong Kong, as well as the U.S. election victory of a candidate who has expressed a pro-crypto stance.

Based on data submitted by the nation's top five virtual asset trading platforms, domestic virtual asset markets appear to have seen a huge jump in total assets, deposits, and daily average transaction value starting in November 2024, which coincides with a candidate's victory in the U.S. presidential election that has fueled expectations for more relaxed crypto regulations.

Trends in Virtual Asset Regulations

Highlights of the Act on the Protection of Virtual Asset Users

The Act on the Protection of Virtual Asset Users is broadly concerned with protecting the assets of investors and curbing unfair or deceptive practices. Concretely, virtual asset trading platforms and other service providers are required to segregate funds deposited by investors for trading purposes from their own deposits and hold them in a separate bank account or in a trust (Article 6). Virtual asset service providers also have a duty to compensate investors for losses resulting from hacking and theft or from trading interruptions caused by technical failures at trading desks (Article 8). In order to meet these liabilities, virtual asset service providers are furthermore required to enroll in insurance or mutual aid programs, or accumulate reserves (Article 8). To prevent unfair trade practices, the Act prohibits the use of material non-public information, market manipulation, and illegal transactions. It also holds offenders liable for any losses resulting from engaging in these acts, as well as imposes penalty surcharges on them (Articles 10 and 17).

Regulatory Activities by Financial Authorities

Since the entry into force of the Act on the Protection of Virtual Asset Users, financial authorities have established subordinate regulations necessary for the regulation and oversight of virtual assets (Regulation on the Supervision and Investigation of Virtual Assets, etc.) and have taken other essential steps for the enforcement of the new law, including the establishment of dedicated units assigned to deal with relevant tasks.

The FSC set up the "Virtual Asset Division," which is responsible for developing virtual asset policies. In November 2024, an advisory board called the "Virtual Asset Committee" was also established to advise on policies and institutional matters related to the virtual asset market and virtual asset service providers. The committee will deliberate on key issues concerning virtual asset market regulation,

154) For more on this topic, see "Box IV-2. Virtual Asset Market Activity Following the Entry into Force of the Act on the Protection of Virtual Asset Users."

such as the broadening of virtual asset market participation by corporations, whether to approve spot virtual asset ETFs, and regulatory approaches for stablecoins, as well as the second phase of legislative efforts to build upon the groundwork laid by the Act on the Protection of Virtual Asset Users.

Figure IV-9. Virtual Asset Committee in deliberation (January 15, 2025)

Source: Bank of Korea.

The FSS added two new units, the "Virtual Asset Investigation Department" and the "Virtual Asset Supervision Department," tasked with conducting research into virtual assets and supervising virtual asset markets, respectively. In September 2024, the FSS unveiled its "Examination Plan" that provides details about the examinations that will be conducted to verify virtual asset service providers' compliance with their legal and statutory duties. The FSS intends to regularly inspect the investor protection mechanisms at virtual asset service providers, with an emphasis on priority items listed in the Examination Plan.[155)]

Discussions on the Second Phase of Virtual Asset Legislation

With the second phase of virtual asset legislation already in discussion, the coming year is likely to see a flurry of legislative activity as the government moves to build upon the Act on the Protection of Virtual Asset Users with a new, comprehensive law. The regulation of market entry and operations of virtual asset service providers, their classification into subtypes, the establishment of transparent listing and disclosure rules, and the creation of a regulatory framework for stablecoins are expected to be the focus of future legislative discussions.

Stablecoins deserve particular attention insofar as, unlike other virtual assets, these cryptocurrencies are designed to function similarly to traditional payment instruments. If and when stablecoins attain mass adoption, they can be substituted for legal tender and poten-

155) Including 1) ensuring that appropriate investor protection mechanisms, such as the segregation of investors' deposits and virtual assets, are in place (Articles 6 and 7 of the Act) and that necessary liability insurance coverage is bought to cover investor claims associated with losses caused by hacking and technical failures (Article 8), 2) conducting preventive inspections of service providers that have inadequate investor protection systems, such as internal control of the safekeeping and management of investors' virtual assets or procedures to report safety issues to supervisory authorities, and 3) assuring compliance with requirements related to the prevention of unfair trading practices, such as whether a system of oversight is in place to monitor abnormal transactions, including market manipulations (Article 12), and the status of overall business operations.

tially undermine monetary sovereignty[156] (e.g., dollarization), hindering the effectiveness of monetary policy. Any rulemaking concerning stablecoins must involve careful and thorough consideration of its full impact, especially as a coin run, triggered by external shocks, could lead to contagion in traditional financial markets, threatening the stability of the overall financial system and payment and settlement systems. As part of a broader effort to build a suitable and thriving payment and settlement ecosystem for the digital finance environment, the BOK plans to take an active part in future discussions concerning the regulation of stablecoins and provide its input about the best policy approaches.

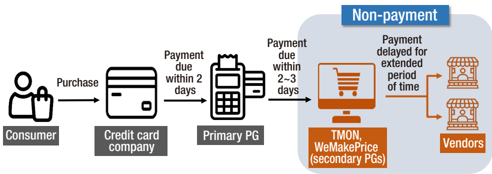
156) The IMF cited accelerated currency substitution among the key risks arising from a widespread adoption of global stablecoins ("Regulating the Crypto Ecosystem: The Case of Stablecoins and Arrangements" (IMF, September 2022)).

4. Regulatory Improvements in the Wake of the TMON-WeMakePrice Event and Implications

Background

In July 2024, TMON and WeMakePrice, two e-commerce companies (online marketplace platforms), also acting as payment gateways (PGs),[157] failed to make payments to vendors. Although such an event, in which consumers and sellers bore the brunt of the fallout from a failing e-commerce platform, is not without precedent, this case stands out in that its impacts were widespread and far-reaching due to the platforms' hybrid business model, which blended retail sales with finance and had the multi-tiered structure of a payment gateway. All intermediaries involved in the two platforms' payment chain, including primary PGs, card companies, easy payment service providers, and banks, were harmed by this event. Following the Half Plaza[158] incident in 2002, escrow accounts were introduced, and following the Merge Plus incident in 2021, the management of funds loaded onto prepaid cards was reinforced. The failures of TMON and WeMakePrice are expected to bring about similarly extensive regulatory changes in the e-commerce space and the electronic payment market. This article will examine the timeline and causes of the TMON-WeMakePrice event, review the actions taken by the government in its wake, and explore policy implications.

Figure IV-10. Vendor payment process flowchart



Source: Bank of Korea.

The TMON-WeMakePrice Event

Timeline

In July 2024, TMON and WeMakePrice, two subsidiaries of Qoo10, failed to disburse payments to vendors by agreed-upon due dates. This stirred up speculation that these platforms might have misappropriated funds owed to vendors. Despite being providers of "intermediary services relating to mail orders by telecommunications" (e-commerce) under the Act on the Consumer Protection in Electronic Commerce and payment gateways (sec-

157) A PG is a platform that acts as an intermediary in electronic financial transactions. It facilitates the acceptance of online payments either by collecting and transmitting customers' payment information or by processing payments on their behalf. PGs can be divided into two types according to their role in the payment flow: primary PGs (receipt of funds from credit card companies → transmission of funds to a secondary PG) and secondary PGs (receipt of funds from a primary PG → disbursement of funds to vendors).

158) An online consumer electronics store that operated between August 2002 and February 2003, which promised 50% discounts on late deliveries and a 150% refund of the purchase price for products out of stock. This business ran a kind of ponzi scheme where products were actually delivered to only a handful of customers, while it pocketed payments for non-existing goods from unsuspecting consumers. Nearly 100,000 consumers lost as much as KRW 30 billion to this online shopping fraud, which severely hurt trust in e-commerce and raised serious concerns about its safety.

ondary PGs) under the Electronic Financial Transactions Act, the two companies did not relay the sales proceeds they received from primary PGs to their vendors. Initially, they claimed that the delay was caused by system errors and kept pushing back the payment dates until they finally declared that payments were postponed indefinitely on July 22. This led to the decision by the primary PGs and easy payment service providers to temporarily suspend their relationships with TMON and WeMakePrice. The authorities urged the two companies to immediately issue refunds to their customers, while also providing them with emergency funding to stabilize their operations. However, on July 29, they ultimately filed for court receivership with the Seoul Bankruptcy Court and requested authorization of autonomous restructuring support programs.

Table IV-4. TMON-WeMakePrice event timeline

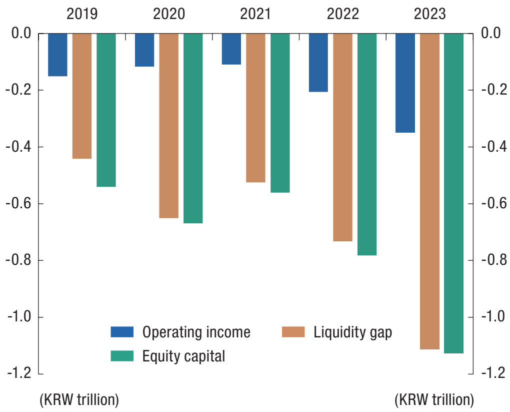
Date	Event
July 8	WeMakePrice delays vendor payments → Start of the event
July 22	TMON declares indefinite postponement of payments
July 24	Primary PGs and easy payment service providers discontinue services to the two companies
July 29	Government announces “Measures to Respond to the TMON-WeMakePrice Event” TMON and WeMakePrice apply for court receivership and autonomous restructuring support programs
August 2	Seoul Bankruptcy Court approves autonomous restructuring support
August 7	Government announces “Additional Response Measures and Regulatory Improvements”
August 21	Government issues “Progress in Response Measures and Future Plans”
September 9	FSC announces “Payment Gateway Regulatory Improvement Plan”
September 10	Seoul Bankruptcy Court approves receivership
October 18	Korea Fair Trade Commission (KFTC) announces “Plan for the Amendment of the Act on Fair Transactions in Large Retail Business”

Source: Bank of Korea.

Causes

Among the chief causes of the TMON-WeMakePrice meltdown, as pointed out by industry insiders, were their weak financial structures, abnormal business practices, and their parent company’s excessive drive to expand business. Although the two companies were the fifth and sixth largest online shopping malls in 2023 (based on the monthly average number of users), their poor financial performance across all key areas, including profitability, liquidity, and capital adequacy, belied their positions in the industry. Intensifying competition in the online marketplace space continuously pushed these two companies further into the red (based on the two companies’ consolidated figures), with their negative liquidity gaps (liquid assets less liquid liabilities) and the extent of capital erosion each exceeding KRW 1 trillion in 2023.

Figure IV-11. Key financial indicators of TMON-WeMakePrice (consolidated indicators for both companies)



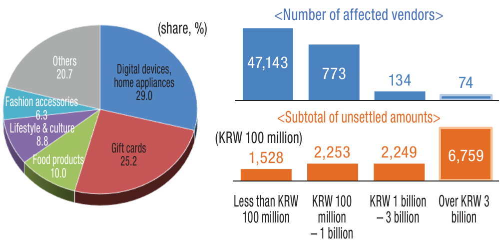
Source: DART.

As their liquidity conditions worsened, TMON and WeMakePrice were suspected of having attempted to meet their funding needs[159] by extending the settlement cycle[160] and conducting massive discount sales of gift cards.[161] Suspicions were also raised that some of the unpaid sales proceeds might have been used to fund the parent company's expansion spree. Over the previous two years, Qoo10 acquired five domestic and foreign companies.[162] According to industry insiders, this may have been to generate more business for QExpress, a logistics subsidiary of Qoo10, for which the company was seeking NASDAQ listing.

Financial Fallout

As of August 2024, KRW 1.3 trillion worth of payments owed to vendors were still overdue or in default, affecting an estimated 48,000 small businesses.[163] By type of business, the largest losses were suffered by distributors of digital devices and home appliances[164] (29.0% of total losses), followed by gift cards (25.2%) and food products (10.0%) companies. Over one half of total losses (KRW 675.9 trillion, 52.9%) was accounted for by 74 firms.

Figure IV-12. Defaulted payments by business type



Source: Ministry of Economy and Finance, press release (August 25).

Although this event had no direct effect on payment and settlement systems,[165] it resulted in substantial fallout on consumers and small businesses and impacted primary PGs, credit card companies, and easy payment service providers in the payment chain through massive payment cancellations and refunds. Its widespread repercussions sparked debates

159) For further details, see "The TMON and WeMakePrice Crisis: Key Issues and Challenges" (Korea Capital Market Institute, September 2024).

160) In October 2023, TMON changed its settlement cycle to 40 days from the last day of the month during which a sale occurred and WeMakePrice to two months and seven days from the last day of the month. Settlement cycles of other e-commerce platforms were significantly shorter, ranging from two days after the sale date (11th Street) to 15 days from the last day of the month during which a sale was registered (Coupang).

161) TMON and WeMakePrice launched an aggressive promotional campaign that sold mobile gift cards at 7-10% discounts. Because of this, the value of mobile gift cards sold by these two companies made up 59% (KRW 1.2 trillion) of their total sales through an e-commerce platform during the first half of 2024 (KRW 2.0 trillion).

162) The companies were acquired in the following order: TMON (September 2022), Interpark Commerce (March 2023), WeMakePrice (April 2023), U.S. company Wish (February 2024), and AK Mall (March 2024).

163) For more on this topic, see "TF Meeting on the Issues Related to the WeMakePrice and TMON Payout Delays" (Ministry of Economy and Finance, August 2024).

164) Digital devices and home appliances appear to have been the most sold product category due to 1) their high value per unit sold, 2) the availability of a large pool of high-performing vendors, and 3) the ease of obtaining pre-settlement loans on these items.

165) For a detailed discussion on this topic, see "Box IV-3. Payment Gateway Architecture and Relationship to Payment and Settlement Systems."

on regulatory improvement, particularly concerning PGs.

Regulatory Gaps and Government Actions

Lack of Mechanisms to Protect Sales Proceeds

Current laws regulating PGs, such as the Act on Fair Transactions in Large Retail Business (hereinafter “Large Retail Business Act”) or the Electronic Financial Transactions Act, do not provide for mechanisms to protect vendors’ funds. The government is currently working toward the amendment of these two laws to make it mandatory for e-commerce platforms (Large Retail Business Act) and PGs (Electronic Financial Transactions Act) to segregate sales proceeds from their own funds and to prohibit the transfer of vendors’ funds to a third party, their use as collateral or seizure, or the deduction of any fees or payables from them.[166)]

Inadequate Rules Regarding Payment Due Dates

Currently, there are no rules concerning the time frame by which e-commerce platforms and PGs must distribute sales proceeds. Statutory due dates for vendor payments exist only for large offline retailers. The government will therefore seek amendments to the Large Retail Business Act and the Electronic Financial Transactions Act to require e-commerce platforms to pay vendors within 20 days from the date of a sale and PGs to complete payments by the due date negotiated with merchants.

Absence of Supervisory Tools for PGs

No supervisory tools are available for authorities to enforce operating standards on PGs that are not in compliance. In order to address this issue, supervisory regulations will be revised to allow varying levels of enforcement actions, from correction orders to suspension of operations to license revocation, against PGs that fail to satisfy operating standards or practice the segregation of funds as required by law.[167)]

Regulatory Vacuum on Gift Cards

Following the repeal of the Merchandise Coupons Act in February 1992, there has been a complete regulatory vacuum concerning both the issuers of gift cards and the size of issuance, as well as mechanisms to protect user deposits (payments made for purchases of gift cards). However, with the recent amendments to the Electronic Financial Transactions Act, which entered into force in September 2024, most mobile gift cards now fall in the scope of application of this law.[168)] The amended

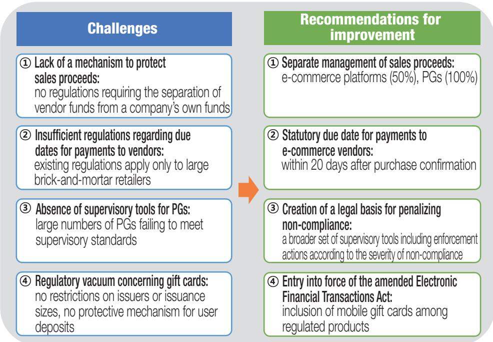
166) For more on this topic, see “Legislative Approaches to Promote Competition in E-Commerce Platform Markets” (Korea Fair Trade Commission, September 2024).

167) For further details, see “Regulatory Improvements Proposed for Payment Gateway Services in Wake of Recent E-Commerce Payment Failures” (FSC, September 2024).

168) The definition and criteria of prepaid electronic payment instrument providers were deleted and paper gift certificates that were converted to mobile gift cards were newly included in regulated product categories. However, this amendment leaves out many important safeguards with respect to paper gift certificates. The amended law does not impose a statutory limit on the size of issuance, with payment of stamp duties being the only requirement, or require a mechanism to protect user deposits.

law requires issuers of mobile gift cards to segregate user deposits from their own funds and limits the offering of discount issues and cashback programs to those issuers that meet certain financial soundness standards.

Figure IV-13. Issues brought to light by the TMON and WeMakePrice event and government responses



Source: Bank of Korea.

Policy Implications

The TMON-WeMakePrice event is a case where two e-commerce platforms, which also acted as PGs, attempted to make up for losses in their e-commerce businesses using sales proceeds they managed in their capacities as PGs. In recent years, the emergence of big tech and the accelerated pace of digital transformation have increasingly blurred boundaries between industries. This highlights risks involved in blending several business models or operating across several different markets.

TMON and WeMakePrice withheld vendor payments for an extended period of time by lengthening settlement cycles, possibly as part of their funding models, effectively acting as interest-free loans. Similar improper practices can also occur in delivery and hotel booking service businesses. Continuous regulatory improvement is needed by assessing the likelihood of the misuse of customer funds and the payment capacity of platforms and PGs in order to prevent losses to consumers and service providers.

To contribute to this effort, the BOK plans to strengthen monitoring and analysis of electronic financial service providers that issue prepaid payment instruments and PGs by making use of its right to request submission of data from them.[169)]

169) Under Paragraph 1 of Article 41 of the Electronic Financial Transactions Act, when necessary for the implementation of monetary and credit policies and the smooth operation of payment and settlement systems, the BOK has the right to request the submission of data from electronic financial businesses.

Box IV-1.

Outcome of Project Mandala

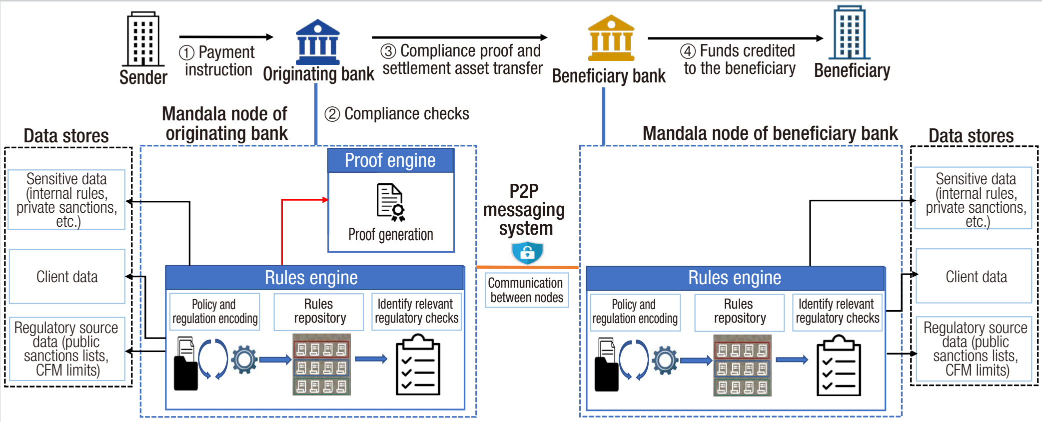
Cross-border payments currently require the involvement of multiple banks, including originating & beneficiary banks, and correspondent banks. Moreover, at every stage of the process, banks have to repeatedly verify sender and beneficiary information and repeat the step of ascertaining the compliance of each transaction with national and world-wide regulations, which significantly slows the speed of delivery and increases service costs. Compliance burdens have been cited as a particular source of friction in cross-border payments as tightened AML and CFT rules have added complexity to the already complicated task of navigating national differences in capital flow management (CFM) policies.

Project Mandala is a proof-of-concept (PoC) project that aims to improve the efficiency of cross-border payment services by automating compliance processes. The project was jointly carried out by the BIS Innovation Hub Centre in Singapore and the central banks of Korea, Australia, Malaysia, and Singapore. The final project report summarizing its outcome was published in October 2024.

When transaction data, including the destination country, sender and beneficiary details, the payment amount, and the method, are entered into the Mandala system by an originating bank, the rules engine generates a pre-validation checklist by automatically identifying applicable regulations. The proof engine checks the compliance of transaction data and generates and sends the proof to the beneficiary bank. As the proof is generated by verifying policies and regulations that are pertinent to the beneficiary bank and the regulatory agencies in the beneficiary's country, it is not necessary for the beneficiary bank to duplicate the compliance check.

Using actual examples of cross-border transactions that require compliance checks against

Cross-border payment process using Mandala system



Sources: BOK diagram based on BIS Innovation Hub Centre.

global regulations and national policies,[170] Project Mandala has demonstrated that it is possible to automate and streamline the compliance process. The project also tested the transmission of digital assets integrated with compliance proofs and interoperability with SWIFT. By applying a variety of privacy preserving technologies, these tests were able to establish that compliance proofs were safely generated and processed.

QR BOX

BIS interview video “Project Mandala: Shaping the Future of Cross-Border Payments Compliance”

170) The transaction scenarios tested included the transfer of loan funds from a Singapore entity to a Malaysian entity and a funds transfer from a Korean manufacturer to an Australian supplier in payment for the purchase of the latter companies’ non-listed debt securities.

Box IV-2.

Virtual Asset Market Activity Following the Entry into Force of the Act on the Protection of Virtual Asset Users[171)]

Overview

The Act on the Protection of Virtual Asset Users, which entered into force on July 19, 2024, gives the BOK Monetary Policy Board the right to request the submission of data from virtual asset service providers[172)] when deemed necessary to support the effective implementation of monetary and credit policies, financial stability or the smooth operation of payment and settlement systems. Based on this authority, the BOK monitors and analyzes activities in virtual asset markets using the transaction data submitted by the top five domestic virtual asset trading platforms.

Since the entry into force of the Act on the Protection of Virtual Asset Users, domestic virtual asset markets have sharply expanded in size, especially after the U.S. election victory on November 5, 2024, of a candidate who has expressed a pro-crypto stance. The number of investors, amount of assets held, and transaction values all saw substantial growth amid renewed expectations of regulatory easing.

Number of Investors

As of the end of December 2024, domestic virtual asset trading platforms (five companies) counted 18.25 million registered investors.[173)] As the sentiment of virtual asset investors improved during the second half of 2024, the total number of investors appears to have continuously risen on the back of new investors joining the fold.

Number of virtual asset investors in 2024[1)]

(10,000 persons)

	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Number of investors	1,672	1,686	1,693	1,703	1,764	1,825

Note: 1) End-of-month basis. Totals may include persons counted more than once because they are registered with more than one trading platform. Excluding corporations.
Sources: Domestic virtual asset trading platforms (five companies).

Investor Deposits

The value of KRW funds deposited with domestic virtual asset trading platforms by resident

171) This article is based on the data the BOK collected from five domestic virtual asset trading platforms through the exercise of its right to request the submission of data under Article 16 of the Act on the Protection of Virtual Asset Users.
172) Item 2 of Article 2 of the Act on the Protection of Virtual Asset Users:
The term “virtual asset service provider” means a person that engages in any of the following acts in connection with virtual assets:
(a) The buying or selling of virtual assets (hereinafter referred to as “trading”);
(b) The exchange of one virtual asset for another;
(c) The transfer of virtual assets, as prescribed by Presidential Decree;
(d) The safekeeping and administration of virtual assets;
(e) The provision of brokerage, intermediation, or agency services in connection with the acts under item (a) or (b);
173) This total may include investors that are counted more than once as they are registered with more than one trading platform.

investors[174] reached KRW 10.7 trillion at the end of December 2024. As investor sentiment was uplifted by rising prices and trading volumes of virtual assets, cash deposits waiting to be invested appear to have also increased.

Investor deposits at virtual asset trading platforms in 2024[1]

(KRW trillion)

	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Deposits	4.9	4.5	4.4	4.7	8.8	10.7

Note: 1) End-of-month basis.
Sources: Domestic virtual asset trading platforms (five companies).

Total Virtual Assets Holdings and Daily Average Value of Transactions

At the end of December 2024, total virtual assets held at five domestic virtual asset trading platforms (total market value of virtual assets held by investors of virtual asset trading platforms) and the daily average transaction value stood at KRW 104.1 trillion and KRW 17.2 trillion, respectively. The total value of virtual assets and the daily average transaction value climbed particularly steeply following a pro-crypto candidate's victory in the U.S. presidential election, after which virtual asset prices soared[175] and investor sentiment improved in the markets.

Total virtual asset holdings and daily average transaction value in 2024

(KRW trillion)

	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Total assets[1]	58.6	50.6	54.7	58.0	102.6	104.1
Transaction value[2]	2.9	2.8	2.8	3.4	14.9	17.2

Notes: 1) End-of-month market value basis.
2) Intramonth basis. Sum of all executed prices of each virtual asset multiplied by the executed volume.
Sources: Domestic virtual asset trading platforms (five companies).

174) KRW funds transferred to a virtual asset trading platform by investors from real-name accounts at partner banks and held as cash balances. The Act on the Protection of Virtual Asset Users (entered into force July 19, 2024) imposes on virtual asset service providers the duty to safeguard investor deposits and requires them to pay a fee equivalent to interest ("deposit use fee") to investors (Article 6).

175) The price of Bitcoin (based on CoinMarketCap) jumped 36.6% from about $67,800 per BTC on November 5, 2024 (the day of the U.S. presidential election) to $92,640 at the end of December 2024.

Box IV-3.

Payment Gateway Architecture and Relationship to Payment and Settlement Systems

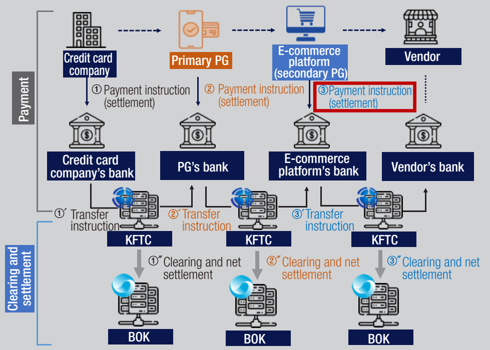
PGs are credit card-accepting businesses under the Specialized Credit Finance Business Act, enabling merchants to accept credit card payments online by entering into an agreement with credit card companies to act as a merchant representative (acquirer). Their role is to send and receive payment requests and approval results and process payments. As PGs interact with credit card companies to process payments on behalf of merchants, this dispenses with the need to enter into a merchant agreement with credit card companies or set up a separate payment system for e-commerce companies. For card companies, partnering with a PG reduces workloads related to acquiring, screening, and managing merchants and settling dues with them.

Many e-commerce companies operate as online marketplaces,[176] which connect sellers with buyers. They receive sales proceeds from a PG and distribute them to their vendors. E-commerce companies that are registered as PGs are known as “secondary PGs” to distinguish them from primary PGs that not only process payments, but also directly exchange transaction data with card companies.

Settlement between card companies and primary and secondary PGs takes place through their respective banks. When these companies submit payment instructions to their banks, payments are cleared and settled via the KFTC’s Electronic Banking System and the BOK’s BOK-Wire+.

The TMON and WeMakePrice’s non-payment event in July 2024 had no disruptive effect on the Electronic Banking System or BOK-Wire+ as TMON and WeMakePrice, as secondary PGs, altogether omitted to submit payment instructions to the bank (③ in the figure below). However, the impact on consumers, vendors, primary PGs, and card companies was substantial.

PG process flow and payment and settlement systems



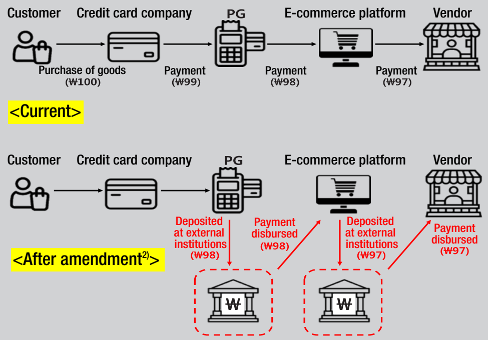
Source: Bank of Korea.

Meanwhile, as discussed in the main body of this report, changes will be made to the current practice in which vendor payments are directly

176) Unlike traditional online shopping malls, online marketplaces are platforms hosting and facilitating transactions for multiple vendors that directly list products and services.

received and managed by PGs and e-commerce companies, by, among others, requiring the segregation of vendor funds (held in a separate bank account, payment guarantee, etc.). Under the new arrangement, while the interaction between buyers and PGs remains the same, funds will now be disbursed to e-commerce platforms and sellers from banks where sellers' proceeds are held.

Change in settlement process following the amendment of e-commerce laws[1]



Notes: 1) For payments made for goods and services using a credit card under a new arrangement where funds are held in a separate account.
2) For companies classified as large retail distributors under the amended law.
Source: Bank of Korea.

Annex

1. Payment and Settlement Systems Designated for Settlement Finality

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

Operator	System	Operating Rules	Effective Date and Time
BOK	BOK-Wire+	Regulations, Working Regulations, and Sub-Regulations on the Operation and Management of the Payment and Settlement Systems	Aug. 21, 2006, 09:30
KFTC	Electronic Banking System	Regulations and Working Rules of the Electronic Banking System	Aug. 21, 2006, 07:00
	Interbank Funds Transfer System	Regulations and Working Rules of the Interbank Funds Transfer System	Aug. 21, 2006, 09:30
	CD/ATM System	Regulations and Working Rules of the CD/ATM System	Aug. 21, 2006, 07:00
	Checks Clearing System	Regulations on Check Clearing, Regulations on Real-Time Information Sharing on Cashier's Checks, Regulations on Electronic Bills, Regulations on Local LC Bills Clearing,[1] Regulations and Working Rules on Information Sharing on Business Purchase Loan Bills, Special Regulations on Check Clearing during Emergencies and Disasters	Jan. 10, 2014, 00:00
	Giro System	Regulations and Working Rules of the Giro System	
	Cash Management Service (CMS) System	Regulations and Working Rules of the Cash Management Service (CMS) System	
CLS Bank	CLS System	CLS Bank International Rules, Settlement Member Agreement	Aug. 21, 2006, 09:30

Note: 1) Limited to KRW and USD-denominated LCs.

b. Clearing and settlement systems operated by entities providing clearing and settlement services for securities and derivatives transactions pursuant to the Financial Investment Services and Capital Markets Act or to other laws and other entities as designated by presidential decree (as referenced to in Articles 120(2) and 336 of the Debtor Rehabilitation and Bankruptcy Act).

☐ Clearing and settlement systems operated by the KRX and the KSD.

2. Statistics

A. Settlement Volume and Value by Payment and Settlement System

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

		2021	2022	2023	2024	% change
Volume	BOK-Wire+	22.2	23.3	23.3	25.5	9.7
	Retail Payment Systems	32,614	36,230	39,878	44,051	10.5
	Checks Clearing System	175	154	114	84	-25.9
	Giro System[1)]	4,120	4,104	4,050	4,269	5.4
	Interbank Shared Networks	28,319	31,971	35,714	39,698	11.2
	(Electronic Banking System)	19,041	21,333	23,938	26,362	10.1
	(Interbank Funds Transfer System)	254	238	231	222	-3.7
	(CD/ATM System)	1,064	967	892	821	-8.0
	(CMS System)[1)]	3,913	4,077	4,239	4,448	4.9
	(Regional Bank Shared System)	0.3	0.3	0.3	0.2	-13.8
	(E-commerce Payment System)	138	121	104	104	0.5
	(EFT/POS System)	0.0	0.0	0.0	0.0	-77.8
	(Open Banking System)[1)]	3,908	5,234	6,310	7,740	22.6
Value	BOK-Wire+	488,491	524,331	554,611	616,987	11.2
	Retail Payment Systems	94,338	99,279	100,071	106,443	6.4
	Checks Clearing System	7,039	7,340	7,232	7,119	-1.6
	Giro System[1)]	1,098	1,174	1,237	1,353	9.3
	Interbank Shared Networks	86,201	90,765	91,602	97,971	7.0
	(Electronic Banking System)	78,757	83,473	84,283	90,383	7.2
	(Interbank Funds Transfer System)	5,504	4,885	4,622	4,611	-0.2
	(CD/ATM System)	655	584	514	462	-10.0
	(CMS System)[1)]	409	439	454	460	1.4
	(Regional Bank Shared System)	4.8	4.5	4.0	4.1	1.3
	(E-commerce Payment System)	18	17	16	17	2.8
	(EFT/POS System)	0.0	0.0	0.0	0.0	-69.3
	(Open Banking System)[1)]	853	1,364	1,709	2,034	19.0

Note: 1) Including deposits and withdrawals.

B. Settlement Volume and Value through BOK-Wire+

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

		2021	2022	2023	2024	% change
Volume	Funds Transfers Between Participants	21,027	22,047	21,995	24,233	10.2
	Call Settlement Funds	342	335	400	429	7.4
	(Call Transaction System)	342	334	399	429	7.3
	(General Funds Transfers)	0	0	0	1	133.8
	Securities Settlement Funds	15,989	16,757	16,426	18,323	11.6
	(DvP System)	14,828	15,616	15,304	17,139	12.0
	(Non-DvP Funds Transfers)	1,161	1,141	1,122	1,184	5.5
	Foreign Exchange Settlement Funds	514	528	615	620	0.8
	(CLS System)	39	40	40	40	1.4
	(Non-PvP Funds Transfers)	475	488	576	580	0.7
	Institutional Customer Settlement Funds	2,978	3,205	3,309	3,564	7.7
	(Beneficiary-Designated Funds Transfers)	957	994	1,005	1,046	4.1
	(General Funds Transfers)	731	734	759	773	1.9
	(Linked Settlement)	1,290	1,478	1,545	1,745	12.9
	Net Settlement Funds	237	240	238	236	-1.1
	Other	967	983	1,007	1,060	5.2
	Funds Transfers Between the BOK and Participants	1,179	1,244	1,294	1,306	0.9
	Treasury Funds Transfers[1]	1,101	1,156	1,205	1,223	1.6
	BOK Loans	26	34	34	29	-14.6
	Government and Public Bond Transactions[2]	52	54	55	53	-3.4
	Total Funds Transfers in Korean Won	22,206	23,290	23,289	25,539	9.7
	Total Funds Transfers in Foreign Currency[3]	7.2	8.2	9.1	8.8	-3.2
Value	Funds Transfers Between Participants	465,366	497,264	533,321	601,122	12.7
	Call Settlement Funds	20,603	23,058	28,047	28,795	2.7
	(Call Transaction System)	20,596	23,047	28,043	28,787	2.7
	(General Funds Transfers)	6	11	4	9	117.1
	Securities Settlement Funds	257,375	269,895	301,201	357,219	18.6
	(DvP System)	205,992	222,890	253,265	306,258	20.9
	(Non-DvP Funds Transfers)	51,382	47,005	47,936	50,961	6.3
	Foreign Exchange Settlement Funds	14,464	16,822	19,163	19,511	1.8
	(CLS System)	3,131	3,645	3,492	3,686	5.6
	(Non-PvP Funds Transfers)	11,333	13,177	15,671	15,825	1.0
	Institutional Customer Settlement Funds	73,602	79,462	79,164	83,695	5.7
	(Beneficiary-Designated Funds Transfers)	17,746	21,046	20,372	21,099	3.6
	(General Funds Transfers)	40,701	41,505	40,797	43,274	6.1
	(Linked Settlement)	15,155	16,912	17,995	19,322	7.4
	Net Settlement Funds	25,889	27,466	26,957	28,406	5.4
	Other	73,435	80,560	78,790	83,497	6.0
	Funds Transfers Between the BOK and Participants	23,124	27,067	21,290	15,864	-25.5
	Treasury Funds Transfers[1]	9,493	10,398	9,175	8,969	-2.2
	BOK Loans	3,463	3,812	3,139	2,278	-27.4
	Government and Public Bond Transactions[2]	10,168	12,857	8,976	4,617	-48.6
	Total Funds Transfers in Korean Won	488,491	524,331	554,611	616,987	11.2
	Total Funds Transfers in Foreign Currency (USD million)[3]	1,128	1,637	1,210	1,195	-1.2

Notes: 1) Based only on transactions processed through BOK-Wire+ (investment of surplus funds, sales and redemption of investment assets, national tax payments).

2) Issue and redemption of government bonds and monetary stabilization bonds, and government and public bond sales transactions (including repurchase agreements) by the BOK.

3) Including deposits and withdrawals.

C. Funds Transfers Between the BOK and Participants

(KRW trillion, %)

	2021	2022	2023	2024	% change
Payments to and from the Treasury Through the BOK Treasury Network[1]					
Real-Time Electronic Transfers	19.4	22.6	19.6	21.3	8.8
File Transfers	2.4	2.8	2.7	2.7	-0.5
(Treasury Payments)	2.1	2.4	2.3	2.3	0.0
(National Tax Refunds)	0.3	0.4	0.5	0.4	-2.7
Government and Public Bond Transactions via BOK Securities Systems[2]					
Issuance and Redemption of Monetary Stabilization Bonds					
(Issuance)	125.4	104.7	129.6	87.7	-32.3
(Redemption)	144.3	132.3	120.6	93.7	-22.3
Securities Transactions	918.6	1,269.1	685.4	244.4	-64.3
(Repo Purchases)	4.0	26.8	50.9	106.1	108.6
(Repo Sales)	908.6	1,235.3	634.5	138.3	-78.2
(Outright Purchases)	6.0	7.0	0.0	0.0	-
Securities Lending (Borrowings)	0.0	7.0	17.0	0.0	-100.0
Government Bonds					
(Issuance)	180.5	168.6	165.7	157.7	-4.8
(Redemption)	63.6	74.8	105.2	108.5	3.2
Fiscal Securities					
(Issuance)	28.9	16.3	44.5	49.8	11.9
(Redemption)	28.9	16.3	44.5	49.8	11.9
BOK Loans[3]	40.3	41.0	19.5	24.5	25.6
Bank-Intermediated Loans	37.8	39.3	19.4	24.5	26.0
Loans to Acquisition Vehicles Purchasing Corporate Bonds and CPs[4]	2.5	1.7	0.1	0.0	-100.0
Liquidity Adjustment Loans	0.0	0.0	0.0	0.1	-

Notes: 1) Based on daily average.
2) Based on par value.
3) Year-end balance of outstanding BOK loans to financial institutions excluding loans to the government.
4) Special Purpose Vehicles (SPVs).

D. Payment Volume and Value by Payment Instrument

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

		2021	2022	2023	2024	% change
Volume	Checks and Bills	271	235	177	138	-22.1
	Cleared via Checks Clearing System	175	154	114	84	-25.9
	Presented Directly at Issuer's Windows	89	75	57	48	-16.6
	Electronic Bills	6.5	6.0	5.9	5.7	-2.6
	Account Transfers[1)]	31,967	35,604	39,305	43,526	10.7
	Payment Cards	66,900	73,453	78,379	81,058	3.4
	Credit-Based (Credit Cards)	42,044	46,400	50,097	51,918	3.6
	(Purchases)	41,882	46,240	49,930	51,755	3.7
	(Cash Advances)	162	161	167	163	-2.7
	Debit-Based	24,352	26,488	27,925	28,838	3.3
	(Check Cards)	24,163	26,271	27,648	28,532	3.2
	(Cash Cards)[2)]	189.5	216.9	276.7	306.5	10.7
	(Debit Cards)	0.0	0.0	0.0	0.0	-77.8
	Prepaid (Prepaid Cards)	504	565	358	302	-15.5
	E-Money	0.1	0.1	0.1	0.0	-53.5
Value	Checks and Bills	18,900	16,662	15,555	15,981	2.7
	Cleared via Checks Clearing System	7,039	7,340	7,232	7,119	-1.6
	Presented Directly at Issuer's Windows	7,975	7,189	6,196	6,488	4.7
	Electronic Bills	3,886	2,133	2,127	2,374	11.6
	Account Transfers[1)]	87,152	91,787	92,690	99,174	7.0
	Payment Cards	2,909	3,266	3,460	3,596	3.9
	Credit-Based (Credit Cards)	2,312	2,611	2,780	2,894	4.1
	(Purchases)	2,160	2,453	2,621	2,734	4.3
	(Cash Advances)	152	158	159	160	0.4
	Debit-Based	584	640	670	695	3.7
	(Check Cards)	581	637	666	690	3.6
	(Cash Cards)[2)]	2.8	3.3	4.5	4.9	9.8
	(Debit Cards)	0.0	0.0	0.0	0.0	-69.3
	Prepaid (Prepaid Cards)	12.6	14.5	9.7	6.9	-28.7
	E-Money	0.0	0.0	0.0	0.0	-43.6

Notes: 1) Excluding account transfers via BOK-Wire+.
2) A kind of debit card launched in November 2012.

E. Usage of Electronic Banking and Easy Payment Services

(daily average, thousands of persons, transactions, sheets, KRW billion, %)

			2021	2022	2023	2024	% change
Internet Banking[1]	Number of Subscribers[2)3)]		190,859	207,036	224,011	241,864	8.0
	(Individuals)		178,942	194,256	210,463	227,548	8.1
	(Corporations)		11,917	12,780	13,548	14,317	5.7
	Volume of Use		17,321	19,712	22,652	25,509	12.6
	Value of Use		70,554	76,339	82,006	87,206	6.3
Mobile Banking	Number of Subscribers[2)3)]		153,369	169,219	186,524	203,617	9.2
	Volume of Use		14,363	16,841	19,848	22,666	14.2
	Value of Use		12,858	14,176	15,204	16,868	10.9
E-Money	Volume of Issuance[3)]		16,251	16,263	15,468	16,300	5.4
	Value of Use		0.0	0.0	0.0	0.0	-0.5
Electronic Bills	Issuance	Volume	5.4	5.2	5.0	4.8	-4.6
		Value	5,754	4,147	3,672	3,642	-0.8
	Discounts	Volume	0.8	0.8	0.7	0.6	-7.0
		Value	46.0	48.4	46.0	43.8	-4.8

Notes: 1) Including mobile banking.
2) Based on the customers of 19 domestic banks (including three internet-only banks) and the Korea Post (postal banking). Total may include double-counting of customers subscribed to more than one bank's services.
3) End-of-year basis.

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

		2021[1)]	2022[1)]	2023	2024	% change
Easy Payment Service[2)]	Volume of Use	19,812	24,125	27,351	30,716	12.3
	Electronic Financial Service Providers	11,237	13,614	15,170	18,009	18.7
	(Credit Cards)[3)]	5,626	6,724	7,346	8,405	14.4
	(Prepayment Means)	4,964	6,129	6,942	8,569	23.4
	(Account Transfers)	648	761	883	1,035	17.2
	Mobile Device Manufacturers	5,542	7,173	8,598	9,254	7.6
	Financial Institutions	3,032	3,339	3,584	3,452	-3.7
	Value of Use	607	761	875	959	9.6
	Electronic Financial Service Providers	301.4	379.9	427.7	481.4	12.5
	(Credit Cards)[3)]	194.0	238.5	261.2	288.5	10.4
	(Prepayment Means)	88.5	118.6	140.1	162.0	15.6
	(Account Transfers)	18.9	22.9	26.4	30.9	17.0
	Mobile Device Manufacturers	137.6	185.3	223.8	244.3	9.1
	Financial Institutions	167.6	196.2	223.9	233.8	4.4
Easy Transfer Service	Volume of Use	4,333	5,196	6,358	7,209	13.4
	Electronic Financial Service Providers	3,998	4,811	5,912	6,709	13.5
	Financial Institutions	335.0	385.6	446.6	500.2	11.9
	Value of Use	505	626	777	912	17.4
	Electronic Financial Service Providers	472.3	610.9	766.1	901.6	17.7
	Financial Institutions	32.2	15.0	10.7	10.4	-2.8

Notes: 1) Some figures were revised to reflect corrections reported by source organizations.
2) To more accurately determine the volume of use, the lists of institutions and payment instruments were expanded by adjusting retroactively all time series back to 2016 when related statistics were first recorded.
3) Including check cards.

3. Abbreviations

ATM	Automated Teller Machine
BCP	Business Continuity Plan
BCBS	Basel Committee on Banking Supervision
BIS	Bank for International Settlements
BOK-Wire+	Bank of Korea Financial Wire Network System
CCP	Central Counterparty
CLS	Continuous Linked Settlement
CPMI	Committee on Payments and Market Infrastructures
DNS	Deferred Net Settlement
DvP	Delivery versus Payment
FMI	Financial Market Infrastructure
FSB	Financial Stability Board
IMSG	Implementation Monitoring Standing Group
IOSCO	International Organization of Securities Commissions
ISO 20022	International Organization for Standardization 20022
NFC	Near Field Communication
PFMI	Principles for Financial Market Infrastructures
PG	Payment Gateway
RTGS	Real-Time Gross Settlement
SWIFT	Society for Worldwide Interbank Financial Telecommunication

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