

# UPDATE ON FINANCIAL MARKET INFRASTRUCTURES IN ASEAN+3

DECEMBER 2023

## Introduction

The purpose of this document is, firstly, to show that in the markets of the Association of Southeast Asian Nations (ASEAN) plus the People's Republic of China (PRC), Japan, and the Republic of Korea—a grouping collectively known as ASEAN+3—there are full-fledged cash and securities settlement systems that are being continuously maintained and improved. Secondly, this document briefly describes government bond and corporate bond markets in the region. Thirdly, it shares information on current enhancements to financial market infrastructures (FMIs) in the region.

Cross-Border Settlement Infrastructure Forum (CSIF) members have an incentive to introduce new technologies, including distributed ledger technologies and central bank digital currencies, which can impact the functioning of FMIs. Cross-border connections between FMIs, including central securities depository–real-time gross settlement linkages and peer-to-peer connections of fast payment systems, are also being implemented. Finally, CSIF member institutions have agreed to adopt international standards, including International Organization for Standardization (ISO) 20022, for their FMIs to enhance interoperability and the potential to connect to each other.

The Asian Development Bank CSIF secretariat team members express their heartfelt gratitude to the CSIF members and observers for their information, support and advice in compiling this document as well as their contributions to the regular meetings.<sup>1</sup>

## HIGHLIGHTS

- All central banks in ASEAN+3 have developed and are successfully operating real-time gross settlement systems.
- The interoperability of the real-time gross settlement systems has increased drastically compared with the earlier systems because of the adoption of ISO 20022 and latest technologies.
- Markets in the region have been adopting delivery versus payment mechanisms, in which both the bond and cash legs are settled simultaneously. This applies to both government and corporate bond markets.
- Fast payment systems are also rapidly being implemented, and not only for retail payments.
- The Cross-Border Settlement Infrastructure Forum will continue to promote secure regional interoperability through the adoption of new technologies such as blockchain and distributed ledger technologies.

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**Table 1: Real-Time Gross Settlement Systems in ASEAN+3 Member Economies**

<b>Economy</b>	<b>Operator (Central Bank)</b>	<b>Name of the System</b>	<b>Online Local Time Operating Hours</b>	<b>GMT+X<sup>a</sup></b>	<b>Start of Operation</b>	<b>Implementation of ISO 20022</b>
BN	BDCB	RTGS	9 a.m.–5 p.m. <sup>b</sup>	+8	2014	2014
CN	PBOC	HVPS	8 p.m. (-1)–5 p.m. <sup>c</sup>	+8	2005	2013
CN	PBOC	CIPS2	12 midnight–11:59 p.m.	+8	2018	2018
HK	HKMA	CHATS	8:30 a.m.–6:30 p.m.	+8	1996	(2024)
ID	BI	BI-RTGS	6:30 a.m.–5 p.m.	+7	2000	2026 <sup>d</sup>
JP	BOJ	BOJ-NET	8:30 a.m.–9 p.m.	+9	2016 <sup>e</sup>	2016
KH	NBC	Bakong <sup>f</sup>	24 hours	+7	2018	2018
KR	BOK	BOK-Wire+	9 a.m.–5:30 p.m.	+9	1994	2026 <sup>g</sup>
LA	BOL	LaPaSS	9 a.m.–3:30 p.m.	+7	2020	2022
MY	BNM	RENTAS-IFTS	8 a.m.–9 p.m. <sup>h</sup>	+8	1999	2022
PH	BSP	PhilPaSS	9 a.m.–5:45 p.m.	+8	2002	2021
SG	MAS	MEPS+	9 a.m.–7 p.m.	+8	2006	2022
TH	BOT	BAHTNET	8:30 a.m.–5:30 p.m.	+7	2013	2022
VN	SBV	IBPS	8 a.m.–5 p.m.	+7	2002	N.A.

ASEAN+3 = Association of Southeast Asian Nations plus the People's Republic of China, Japan, and the Republic of Korea; BAHTNET = Bank of Thailand Automated High-value Transfer Network; BDCB = Brunei Darussalam Central Bank; BI = Bank Indonesia; BN = Brunei Darussalam; BNM = Bank Negara Malaysia; BOJ = Bank of Japan; BOJ-NET = Bank of Japan Financial Network System; BOK = Bank of Korea; BOL = Bank of the Lao PDR; BOT = Bank of Thailand; BSP = Bangko Sentral ng Pilipinas; CHATS = Clearing House Automated Transfer System; CIPS2 = Cross-Border Interbank Payment System 2; CN = People's Republic of China; HK = Hong Kong, China; HKMA = Hong Kong Monetary Authority; HVPS = High Value Payment System; IBPS = Internet Banking Payment System; ID = Indonesia; ISO = International Organization for Standardization; JP = Japan; KH = Cambodia; KR = Republic of Korea; LA = Lao People's Democratic Republic; LaPaSS = Lao Payment and Settlement System; MAS = Monetary Authority of Singapore; MEPS+ = MAS Electronic Payment System Plus; MY = Malaysia; N.A. = not applicable; NBC = National Bank of Cambodia; PBOC = People's Bank of China; PH = Philippines; PhilPaSS = Philippine Payment and Settlement System; RENTAS-IFTS = Real-Time Electronic Transfer of Funds and Securities–Interbank Funds Transfer System; RTGS = real-time gross settlement system; SBV = State Bank of Vietnam; SG = Singapore; TH = Thailand; VN = Viet Nam.

Note: The central bank of Brunei Darussalam changed its name from Autoriti Monetari Brunei Darussalam (AMBD) to Brunei Darussalam Central Bank (BDCB) in 2021.

<sup>a</sup> Time difference from Greenwich Mean Time (GMT). <sup>b</sup> BDCB's RTGS operating hours end at 3:30 p.m. on Fridays, and are shorter during Ramadan. <sup>c</sup> HVPS in the People's Republic of China starts operation at 8 p.m. of the previous day and continues operation until 5 p.m. of the day. <sup>d</sup> BI is developing a new generation BI-RTGS system, and the ISO 20022 implementation will occur in conjunction with the new system, estimated to be by 2026. <sup>e</sup> The original BOJ-NET started operation in 1990. <sup>f</sup> Bakong is a hybrid interbank and retail payment system with finality as the ledger is in sync with the central bank system. <sup>g</sup> BOK-Wire underwent major overhauls in 2009 and 2020. With respect to ISO 20022 implementation, it commences in 2023 and will be complete by 2026. <sup>h</sup> RENTAS operation from 6 to 9 p.m. is limited to facilitating batch settlement for retail payment systems (i.e. Direct Debit and Interbank GIRO).

Source: Authors' compilation based on input from CSIF members.

## Financial Market Infrastructures in ASEAN+3

Financial market infrastructures (FMIs), in particular, real-time gross settlement (RTGS) and central securities depository (CSD) systems, are shown in

**Table 1** and **Table 2**, respectively. The operators of the system, operating hours, the year of commencement of production operations, and the year of ISO 20022 implementation are included. Online operating hours are also shown in local time with time differences from

**Table 2: Central Securities Depository Systems in ASEAN+3 Member Economies**

<b>Economy</b>	<b>CSD (Type of Organization)</b>	<b>Name of System</b>	<b>Type of Bond (Govt. or Corp.)</b>	<b>Online Operating Hours, Local Time</b>	<b>Start of Operation</b>	<b>ISO 20022</b>
BN	BDCB (CB and GA)	CSD	Govt.	9 a.m.–4:45 p.m.	2017	2017 <sup>a</sup>
CN	CCDC (CBR)	CBGS	Both	9 a.m.–5 p.m.	2013	2019
CN	CSDC (ExR)	MNS	Corp.	8 a.m.–4 p.m.	2011	2019
CN	SHCH (CBR)	SHCH-SSS	Corp.	9 a.m.–5 p.m.	2010	2022
HK	HKMA (CB and GA)	CMU	Both	8:30 a.m.–5:15 a.m.	1990	2022
ID	BI (CB)	BI-SSSS	Govt.	7:30 a.m.–6:30 p.m.	2003	2027 <sup>b</sup>
ID	KSEI (ExR)	C-BEST	Corp.	4 a.m.–5 p.m.	2000	2021
JP	BOJ (CB)	BOJ-NET	Govt.	8:30 a.m.–9 p.m.	2015	2015
JP	JASDEC (ExR)	BETS	Corp.	9 a.m.–5 p.m.	2014	2014
KH	CSX (Ex)	(Power Screen)	Corp.	8 a.m.–3 p.m.	2018	TBD
KR	KSD (ExR)	e-SAFE	Both	9 a.m.–5:30 p.m.	2011	Planning
LA	LSX (Ex)	Lao Bond Exchange	Both	8:30 a.m.–3 p.m.	2018	N.A.
MY	BNM (CB)	RENTAS-SSDS	Both	8 a.m.–6 p.m.	1999	TBD <sup>c</sup>
MY	BMD (ExR) <sup>d</sup>	CDS	Corp.	8:30 a.m. – 7 p.m.	1992	N.A.
PH	BTr (GA)	BTr-NRoSS	Govt.	9 a.m.–4 p.m.	1996	2021
PH	PDTC (ExR)	PDTC	Corp.	8 a.m.–6 p.m.	1995	2021
SG	MAS (CB and GA)	MEPS+ SGS	Govt.	9 a.m.–7 p.m.	2006	2019
SG	CDP (ExR)	DCSS	Corp.	8:30 a.m.–5:30 p.m.	2015	2019
TH	TSD (ExR)	PTI	Both	7 a.m.–8:30 p.m.	2007	2021
VN	VSDC	VSDC-BES	Both	8 a.m.–5 p.m.	2010	Pending

ASEAN+3 = Association of Southeast Asian Nations plus the People's Republic of China, Japan, and the Republic of Korea; BDCB = Brunei Darussalam Central Bank; BETS = Book-Entry Transfer System; BI = Bank Indonesia; BI-SSSS = Scripless Securities Settlement System; BMD = Bursa Malaysia Depository; BN = Brunei Darussalam; BNM = Bank Negara Malaysia; BOJ = Bank of Japan; BOJ-Net = Bank of Japan Financial Network System; BTr = Bureau of the Treasury; CB = central bank; CBGS = Central Bond Generalized System; CBR = central-bank-related; CCDC = China Central Depository & Clearing Co., Ltd.; CDP = Central Depository (Pte.) Limited; CDS = Central Depository System; CMU = Central Moneymarkets Unit; CN = People's Republic of China; CSD = central securities depository; CSDC = China Securities Depository and Clearing Corporation; CSX = Cambodia Securities Exchange; C-BEST = Central Depository and Book Entry Settlement System; DCSS = Debt Securities Clearing and Settlement System; Ex = exchange; ExR = exchange-related; GA = government agency; HK = Hong Kong, China; HKMA = Hong Kong Monetary Authority; ID = Indonesia; ISO = International Organization for Standardization; JASDEC = Japan Securities Depository Center Incorporated; JP = Japan; KH = Cambodia; KR = Republic of Korea; KSD = Korea Securities Depository; KSEI = PT Kustodian Sentral Efek Indonesia; LA = Lao People's Democratic Republic; LSX = Lao Securities Exchange; MAS = Monetary Authority of Singapore; MEPS+ SGS = MAS Electronic Payment System Plus–Singapore Government Securities; MNS = Multilateral Net Settlement System; MY = Malaysia; N.A. = not applicable; NRoSS = New Registry of Scripless Securities; PDTC = Philippine Depository & Trust Corp.; PH = Philippines; PTI = Post Trade Integration System; RENTAS-SSDS = Real-Time Electronic Transfer of Funds and Securities–Scripless Securities Depository System; e-SAFE = Electronic Speedy, Accurate, Faithful, Efficient System; SG = Singapore; SHCH = Shanghai Clearing House; SHCH-SSS = Shanghai Clearing House–Securities Settlement System; TBD = to be determined; TH = Thailand; TSD = Thailand Securities Depository Co., Ltd.; VN = Viet Nam; VSDC = Vietnam Securities Depository and Clearing Corporation; VSDC-BES = Vietnam Securities Depository and Clearing Corporation–Book-Entry System.

<sup>a</sup> BDCB's CSD operating hours end at 3:15 p.m. on Fridays, and are shorter during Ramadan. <sup>b</sup> BI is developing a new generation BI-SSSS system; the ISO 20022 implementation will occur in conjunction, estimated by 2026. <sup>c</sup> ISO 20022 migration for RENTAS focuses on interbank fund transfer for all RENTAS participants, including the clearing houses. <sup>d</sup> Bursa Malaysia Depository is a wholly owned subsidiary of Bursa Malaysia (exchange holding company) and operates the central depository for securities listed on the exchange.

Source: Authors' compilation based on input by CSIF members.

**Table 3: Fast Payment Systems in ASEAN+3 Member Economies**

Economy	Operator	Name of System	P2P Real time	24/7	ISO 20022	Start of Operation
BN	BDCB	N.A.	N.A.	N.A.	N.A.	N.A.
CN	CNCC	IBPS	Y	Y	Y	2010
HK	HKICL	FPS	Y	Y	Y	2018
ID	BI	BI-FAST	Y	Y	Y	2021
JP	Zengin	Zengin-net	Y	Y	Y	1973
KH	NBC	Bakong	Y	Y	N.A.	2018
KR	KFTC	EBS	Y	Y	N.A.	2001
LA	LAPNet	LMPS	Y	Y	N.A.	2021
MY	PayNet	RPP/DuitNow	Y	Y	Y	2018
PH	BSP	InstaPay	Y	Y	Y	2018
SG	BCS	FAST/PayNow	Y	Y	Y	2014/2017
TH	NITMX	Prompt Pay	Y	Y	Y	2017
VN	SBV	N.A.	N.A.	N.A.	N.A.	N.A.

ASEAN+3 = Association of Southeast Asian Nations plus the People's Republic of China, Japan, and the Republic of Korea; BCS = Banking Computer Services; BDCB = Brunei Darussalam Central Bank; BI = Bank Indonesia; BN = Brunei Darussalam; BOL = Bank of the Lao PDR; BSP = Bangko Sentral ng Pilipinas; CBR = central-bank-related; CN = People's Republic of China; CNCC = China National Clearing Center; EBS = Electronic Banking System; FAST = Fast and Secure Transfers (SG); FPS = Faster Payment System; HK = Hong Kong, China; HKICL = Hong Kong Interbank Clearing Limited; IBPS = Internet Banking Payment System; ID = Indonesia; ISO = International Standardization Organization; JP = Japan; KFTC = Korea Financial Telecommunications and Clearings Institute; KH = Cambodia; KR = Republic of Korea; LA = Lao People's Democratic Republic; LAPNet = Lao National Payment Network, Co; LMPS = Lao Mobile Payment Switching; MY = Malaysia; N.A. = not applicable; NBC = National Bank of Cambodia; NITMX = National Interbank Transaction Management and Exchange; PayNet = Payments Network Malaysia; PH = Philippines; PTP = peer-to-peer; RPP = Retail Payments Platform; SBV = State Bank of Vietnam; SG = Singapore; TH = Thailand; VN = Viet Nam; Y = yes.

Source: Authors' compilation based on input from CSIF members.

Greenwich Mean Time in parentheses. With respect to the CSDs, both government bond and corporate bond CSDs are shown.

All central banks in ASEAN+3 have developed and are already successfully operating RTGS systems. The central banks have adopted and implemented—or are in the process of adopting and implementing—the relevant international standards, including ISO 20022. As such, the interoperability of the RTGS systems has increased drastically compared to the former systems.

The central banks are also seeking to enhance operating hours to provide local currency settlement services continuously to reduce settlement risks. Some central

banks are trying to renovate and/or reconstruct their RTGS system to introduce the latest technologies.

### Outline of Bond Markets in ASEAN+3

The processes of the bond markets—from trade to settlement through trade matching, clearing, and settlement matching—are shown in **Figure 1** and **Figure 2** for ASEAN+3 government bond markets and corporate bond markets, respectively. Generally, delivery-versus-payment (DVP), which simultaneously settles both the bond and cash legs, has been adopted in the region. Outline features of government bond markets and corporate bond markets are also discussed.

### Government Bonds

Government bonds are generally traded in over-the-counter (OTC) markets in ASEAN+3 economies just like in other regions. In the case of Japan, interdealer brokers, such as the Japan Bond Trading Co. Ltd. and Totan ICAP Co. Ltd, provide information technology services. By using such services, major securities companies and investment banks quote and trade bonds as market makers. Most of the traded results are automatically forwarded for processing to the pre-settlement matching system operated by the Japan Securities Depository Center, Inc. (JASDEC). After that, the matched trades are cleared and netted by the Japan Securities Clearing Corporation. Then, netted positions are transferred to the Bank of Japan Financial Network System (BOJ-NET) operated by the Bank of Japan for DVP settlement by using the Japanese Government Bond Book-Entry System and Funds Transfer System. In the case of the Republic of Korea and the Philippines, the government bonds are also traded on the exchanges, for the purpose of maintaining the transparency of trades.

Government bond book-entry systems in ASEAN+3 are operated and managed by central banks in Brunei Darussalam; Cambodia; Hong Kong, China; Indonesia; Japan; Malaysia; and Singapore. With respect to the PRC, the government bond book-entry system is operated mainly by China Central Depository & Clearing and partly by China Securities Depository and Clearing Corporation, depending on the segment the bonds are traded in. In the Republic of Korea, Thailand, and Viet Nam, central securities depositories operate government bond book-entry systems. In the Philippines, the Bureau of the Treasury, which is within the Department of Finance, operates the government bond book-entry system. In the Lao People's Democratic Republic (Lao PDR), most of the government bonds are offered and traded OTC, but some bonds are offered through the Lao Securities Exchange. For Viet Nam, the government bonds are traded through the Hanoi Stock Exchange.

### Corporate Bonds

Most corporate bonds are traded in OTC markets in ASEAN+3 member economies, similar to government bonds. In the case of Japan, the traded results are forwarded to a pre-settlement matching system operated by JASDEC. After confirming the matched results, the bond and cash legs are settled at JASDEC (Book-Entry Transfer System) and the Bank of Japan (BOJ-NET), respectively, using a DVP procedure. But in

Cambodia, all corporate bonds are listed and traded on the exchange. In the People's Republic of China, Indonesia, the Republic of Korea, Lao PDR, Malaysia, and the Philippines, corporate bonds are listed, but OTC trades are larger.

Book-entry systems for corporate bonds are mainly operated by central banks in Malaysia and Hong Kong, China. In the PRC, China Central Depository & Clearing and the Shanghai Clearing House—which operate the clearing and settlement platforms for corporate bonds issued in the Inter-Bank Bond Market and for financial bonds and money market instruments, respectively—are related to regulatory authorities such as the People's Bank of China. The China Securities Depository and Clearing Corporation, which operates the clearing and settlement platform for corporate bonds listed and traded on the exchange market in the PRC, is supervised by the China Securities Regulatory Commission.

Corporate bond book-entry systems in Indonesia, Japan, the Republic of Korea, the Philippines, Singapore and Thailand are operated by central securities depositories. In Cambodia, the corporate bond book-entry system is operated by the Cambodia Securities Exchange. In Viet Nam, the corporate bond book-entry system is operated by the Vietnam Securities Depository. In Lao PDR, corporate bonds are deposited at the Lao Securities Exchange. With respect to a cash settlement for corporate bonds, in the markets where stock exchanges or related entities act as depositories, settlement banks of the exchanges clear cash amounts, but the central banks provide cash settlement facilities in the PRC and the Republic of Korea.

## Current Enhancements to Financial Market Infrastructures in the Region

Financial market infrastructures are present in ASEAN+3 member economies. Particularly, RTGS systems for funds payments and settlements are in operation in all economies in the region. Also, the systems are being enhanced to adopt new technologies and to enable more advanced functions and system performance. In line with current trends, fast payment systems are also being implemented (**Table 3**).

Cross-border linkages are also a hallmark of the current regional trend, with CSD-RTGS linkages as one of the most important achievements of the Cross-Border Settlement Infrastructure Forum (CSIF).



Figure 1: Government Bond Markets of ASEAN+3 Member Economies

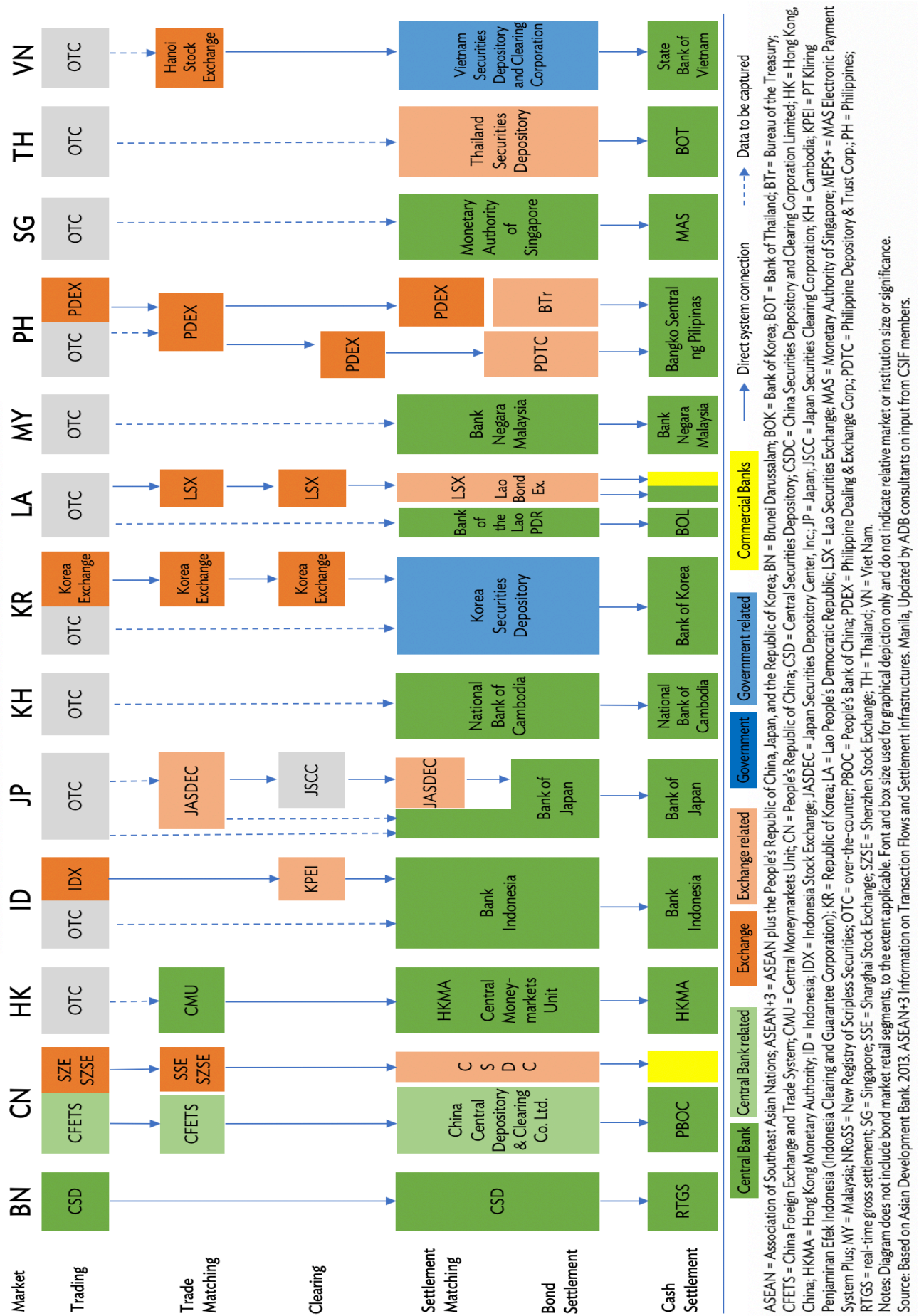
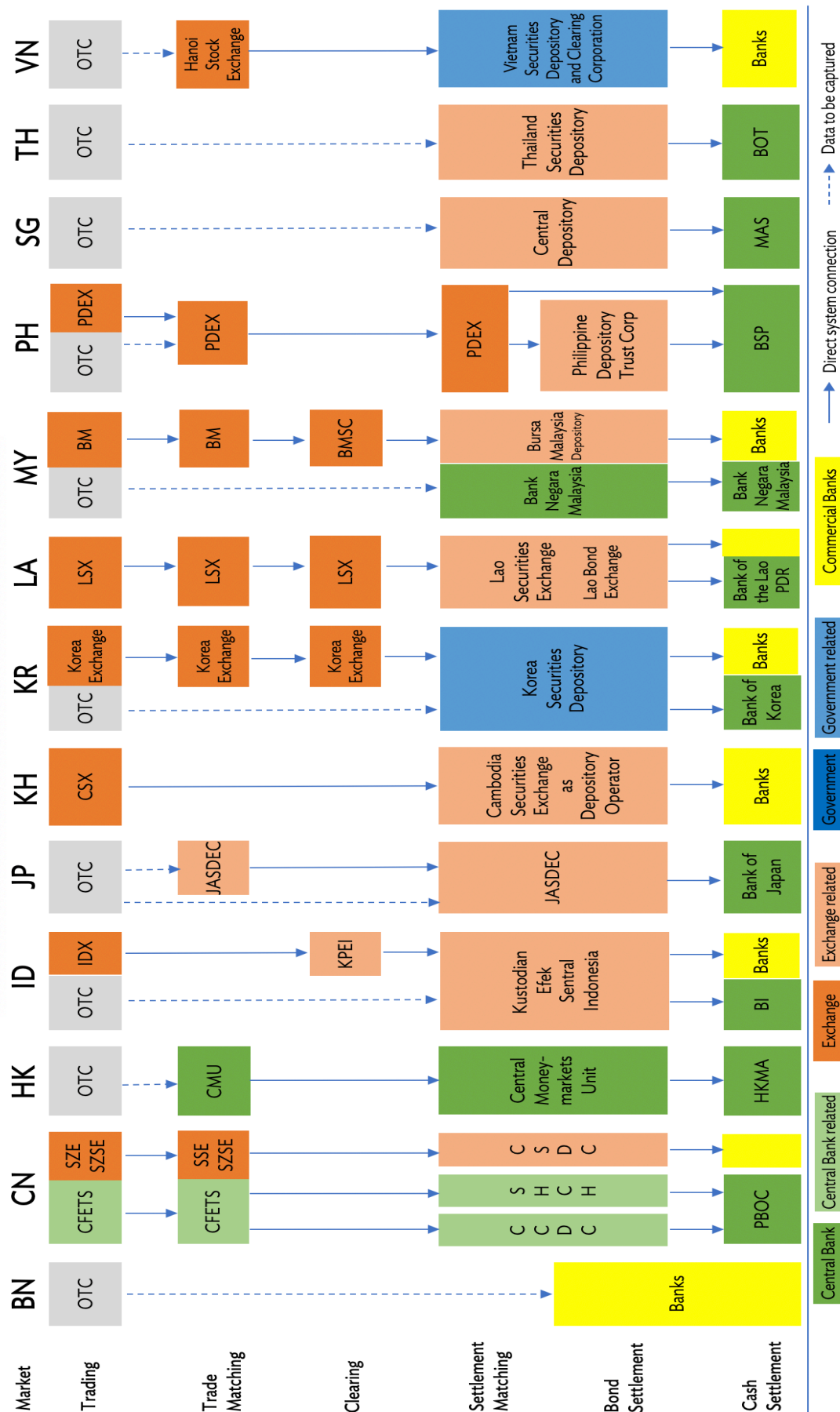


Figure 2: Corporate Bond Markets of ASEAN+3 Member Economies



ASEAN = Association of Southeast Asian Nations; ASEAN+3 = ASEAN plus the People's Republic of China, Japan, and the Republic of Korea; BI = Bank Indonesia; BM = Bursa Malaysia; BMSC = Bursa Malaysia Securities Clearing; BN = Brunei Darussalam; BOT = Bank of Thailand; CFETS = China Foreign Exchange and Trade System; BSP = Bangkok Securities Exchange and Trade System; CCDC = China Central Depository & Clearing Co., Ltd.; CMU = Central Money Markets Unit; CN = People's Republic of China; CSDC = China Securities Depository and Clearing Corporation Limited; CSX = Cambodia Securities Exchange; HK = Hong Kong; HKMA = Hong Kong Monetary Authority; ID = Indonesia; IDX = Indonesia Stock Exchange; JASDEC = Japan Securities Depository Center, Inc.; JP = Japan; KH = Cambodia; KPEI = PT Kiling Perjanjian Efek Indonesia (Indonesia Clearing and Guarantee Corporation); KR = Republic of Korea; LA = Lao People's Democratic Republic; LSX = Lao Securities Exchange; MAS = Monetary Authority of Singapore; MY = Malaysia; KPEI = over-the-counter; PBOC = People's Bank of China; PDEX = Philippine Dealing & Exchange Corp.; PH = Philippines; SG = Singapore; SHCH = Shanghai Clearing House; SSE = Shanghai Stock Exchange; SZSE = Shenzhen Stock Exchange; TH = Thailand; VN = Viet Nam.

Notes: Diagram does not include bond market retail segments, to the extent applicable. Font and box size used for graphical depiction only and do not indicate relative market or institution size or significance.

Source: Based on Asian Development Bank. 2013. ASEAN+3 Information on Transaction Flows and Settlement Infrastructures. Manila. Updated by ADB consultants based on input from CSIF members.



The connection between BOJ-NET and JGB Services in Japan and the Clearing House Automated Transfer System (CHATS) in Hong Kong, China, is an important example of a CSD-RTGS linkage.

In the retail space, fast payment system networks are increasingly being established between regional economies to enable instant cross-border peer-to-peer payment services with QR codes. For example, QRIS Cross Border in Indonesia, PayNet in Malaysia, PromptPay in Thailand, and PayNow in Singapore, allow cross-border QR payments between each other.

### Cross-Border Settlement Infrastructure Forum

The Asian Bond Markets Initiative (ABMI) was launched in 2003 by the finance ministers of the Association of Southeast Asian Nations (ASEAN) plus the People's Republic of China (PRC), Japan, and the Republic of Korea (collectively known as ASEAN+3) to boost the development of local currency bond markets. The Asian Development Bank has been acting as the ABMI Secretariat since its inception.

The Cross-Border Settlement Infrastructure Forum (CSIF), which has central banks and central securities depositories (CSDs) as members and ASEAN+3 government officials as observers, is a subforum under ABMI that promotes more active intraregional portfolio investments by creating an efficient regional settlement intermediary (RSI).

Cross-border transactions in bonds and other securities are currently processed through custodians and a correspondent banking network (depending on currency), generating an inevitable time lag between the time of trade and the delivery of securities and money, thus increasing credit risk and settlement risk. To address this problem, the CSIF member organizations agreed to establish a central securities depository (CSD)–real-time gross settlement (RTGS) linkage, which directly links the settlement systems of central banks and CSDs. The linkages among national CSDs and central banks' RTGS systems in different regional markets are expected to facilitate intraregional portfolio investments and the use of local currency bonds as collateral, which otherwise have been locked in onshore markets, by enabling cross-border, cross-currency delivery-versus-payment (DVP) of cross-border securities transactions, as well as payment-versus-payment (PVP) of local currencies in the region without a time lag.

## Conclusion

Thanks to the tremendous efforts by CSIF members, the payment and settlement market infrastructures in ASEAN+3 have developed and are now comparable to the advanced markets. Furthermore, the PRC is a front runner of digitalization and, for cross-border retail payments, ASEAN is ahead of the other regions. The original mission and mandate of CSIF is to facilitate cross-border transactions by connecting regional CSD and RTGS systems.

As the technological environment advances, CSIF will explore further possible technological options through the continued promotion of standardization and new technologies including distributed ledger technologies and blockchain.

### About the Asian Development Bank

ADB is committed to achieving a prosperous, inclusive, resilient, and sustainable Asia and the Pacific, while sustaining its efforts to eradicate extreme poverty. Established in 1966, it is owned by 68 members—49 from the region. Its main instruments for helping its developing member countries are policy dialogue, loans, equity investments, guarantees, grants, and technical assistance.



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ISBN 978-92-9270-499-5 (print)

ISBN 978-92-9270-500-8 (electronic)

Publication Stock No. BRF230568-2

DOI: <http://dx.doi.org/10.22617/BRF230568-2>

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