

**Payment, clearing and  
settlement systems in  
Singapore**



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## List of abbreviations

2FA	two-factor authentication
ABS	Association of Banks in Singapore
ADR	American depository receipt
ATM	automated teller machine
BCS	Banking Computer Services Pte Ltd
BO	billing organisation
CAPS	Clearing and Payment Services Pte Ltd
CCP	central counterparty
CDP	Central Depository Pte Ltd
CEPAS	Contactless ePurse Application
CLS	Continuous Linked Settlement
CME	Chicago Mercantile Exchange
CMS	Capital Markets Services
COE	Certificate of Entitlement
CSD	central securities depository
CTS	Cheque Truncation System
CUP	China UnionPay
DCH	designated clearing house
DCSS	Debt Securities Clearing and Settlement System
DDA	direct debit authorisation
DVP	delivery versus payment
EFTPOS	electronic funds transfer at point of sale
ERP	Electronic Road Pricing
ESDN	electronic service delivery network
ETF	exchange-traded fund
ETN	exchange-traded note
FOP	free of payment
GDR	global depository receipt
IBG	interbank GIRO
ICSD	international central securities depository
IDA	Infocomm Development Authority
ILF	intraday liquidity facility
IPO	initial public offering
MAS	Monetary Authority of Singapore
MCB	Minimum Cash Balance

MEPS+	New MAS Electronic Payment System
MEPS+-IFT	MEPS+ Interbank Funds Transfer
MEPS+-SGS	MEPS+ Singapore Government Securities
MICR	magnetic ink character recognition
MLA	Minimum Liquid Assets
MPSVF	multipurpose stored value facility
MRT	Mass Rapid Transport
NETS	Network for Electronic Transfers (Singapore) Pte Ltd
OTC	over-the-counter
OTP	one-time password
PSMS	Pre-Settlement Matching Service
PS(O)A	Payment Systems (Oversight) Act
PVP	payment versus payment
QFB	qualifying full bank
QUEST-ST	Quotation and Execution System for Trading
REIT	real estate investment trust
RTGS	real-time gross settlement
SACH	Singapore Automated Clearing House
SAM	Self-service Automated Machine
SCHA	Singapore Clearing House Association
SFA	Securities and Futures Act
SIPS	systemically important payment system
SGDCCS	Singapore Dollar Cheque Clearing System
SGS	Singapore Government Securities
SGX	Singapore Exchange Ltd
SGX-DC	Singapore Exchange Derivatives Clearing Ltd
SGX-DT	Singapore Exchange Derivatives Trading Ltd
SGX-ST	Singapore Exchange Securities Trading
SMS	short message service
SPSVF	single-purpose stored value facility
SSS	securities settlement system
SVF	stored value facility
SWIFT	Society for Worldwide Interbank Financial Telecommunication
SYOG PPC	Singapore Youth Olympic Games DBS Visa Prepaid Card
SWIPS	system-wide important payment system
USDCCS	US Dollar Cheque Clearing System
WASVF	widely accepted stored value facility

## Introduction

The evolution of Singapore's payment, clearing and settlement systems has been driven by technological progress, changing consumer needs and the development of new financial activities. It has moved from a paper- and cash transaction-based system to one with a diverse range of alternative payment instruments, supported by efficient and reliable clearing and settlement infrastructure.

The majority of non-cash retail payments utilise interbank GIRO (IBG) debit and credit transfers as well as payment cards (stored value, debit and credit cards) and cheques. Bank customers can also use their debit cards to make third-party account funds transfers and to pay bills via automated teller machines (ATMs) and self-service kiosks. Other payment channels that have seen recent growth include contactless card payments and mobile and internet banking services.

The Monetary Authority of Singapore (MAS) operates an electronic payments and book-entry system, the New MAS Electronic Payment System (MEPS+), which supports large-value local currency interbank funds transfers and the settlement of scripless<sup>1</sup> Singapore Government Securities (SGS) between MEPS+ participants, subject to the availability of funds or securities.

Singapore dollar (SGD) cheque clearing, US dollar (USD) cheque clearing and interbank GIRO clearing services are provided by the Singapore Automated Clearing House (SACH), which is operated by the Banking Computer Services Pte Ltd (BCS).

The two main providers of securities clearing and settlement systems in Singapore are MAS and the Central Depository Pte Ltd (CDP). The MEPS+ Singapore Government Securities (MEPS+-SGS) subsystem at MAS clears and settles SGS trades while the CDP operates securities settlement systems for Singapore equities, corporate debt securities and other securities. CDP also operates as a central counterparty (CCP) and a central securities depository (CSD). The derivatives clearing and settlement system is operated by Singapore Exchange Derivatives Clearing Ltd (SGX-DC). Both the CDP and SGX-DC are wholly owned subsidiaries of Singapore Exchange Ltd (SGX).

## 1. Institutional aspects

### 1.1 The general legal and regulatory framework

MAS has explicit legal powers to establish and operate real-time gross settlement (RTGS) systems, oversee payment systems including cheque clearing and IBG systems, and regulate the issuance of multipurpose stored value facilities (MPSVFs). These powers are specified by various acts and regulations as highlighted in the table below.

CDP is a designated clearing house regulated under the Securities and Futures Act (SFA) and its relevant subsidiary legislation. The CDP clearing rules and delivery versus payment (DVP) rules govern its operations, its admission requirements and the ongoing obligations of its members.

The following table sets out the relevant legislation and regulations under the purview of MAS that apply to payment instruments and institutions in Singapore.

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<sup>1</sup> SGS are dematerialised.

Payment instrument and/or institution	Legislation, regulations and bye-laws	Description
Cheques and GIRO	<i>Section 59 of the Banking Act (Chapter 19)</i> <sup>1</sup>	This provision of the Banking Act allows MAS, in conjunction with banks and other financial institutions, to establish a clearing house to facilitate the clearing of cheques and credit instruments, and ensure its smooth operation.
Cheques and GIRO	<i>Payment Systems (Oversight) (Singapore Dollar Cheque Clearing System and Inter-Bank GIRO System) Regulations 2006</i> <sup>2</sup>	These regulations set out the rules, obligations and procedures relating to participation in the Singapore Dollar Cheque Clearing System (SGDCCS) and the IBG.
Cheques and GIRO	<i>Payment and Settlement Systems (Finality and Netting) Act (Chapter 231)</i> <sup>3</sup>	The SGDCCS, the US Dollar Cheque Clearing System (USDCCS) and the IBG are designated under the Payment and Settlement Systems (Finality and Netting) Act.
Continuous Linked Settlement (CLS)	<i>Payment and Settlement Systems (Finality and Netting) Act (Chapter 231)</i>	<p>CLS is a designated payment system under the Payment and Settlement Systems (Finality and Netting) Act.</p> <p>CLS Bank is chartered and supervised by the Federal Reserve System, which includes both the Board of Governors of the Federal Reserve System and the Federal Reserve Bank of New York. The G10 and other central banks of issue for CLS-settled currencies established a Protocol for the Cooperative Oversight Arrangement of CLS<sup>4</sup> in November 2008 to provide a mechanism for mutual assistance in carrying out their individual responsibilities in pursuit of their shared public policy objectives for the safety and efficiency of payment and settlement systems and their focus on the stability of the financial system. MAS is a participating central bank in this Cooperative Oversight Arrangement.</p>
Currency	<i>Currency Act (Chapter 69)</i> <sup>5</sup>	MAS is the sole issuer of currency in Singapore. Under the Currency Act, the currency in circulation must be 100% backed by external assets. <sup>6</sup> This is achieved through the maintenance of a currency fund consisting of gold, silver and foreign exchange in the form of demand and time deposits, treasury bills, notes, coins as well as other eligible assets.
Payment systems	<i>Payment Systems (Oversight) Act 2006 (Chapter 222A) (PS(O)A)</i> <sup>7</sup>	<p>The PS(O)A provides for the oversight of payment systems and stored value facilities (SVFs) in Singapore.</p> <p>The PS(O)A gives MAS powers over payment systems, payment instruments and participants in payment systems, covering three main areas (for details, see Section 1.2.3):</p> <ul style="list-style-type: none"> <li>(i) The designation of payment systems as systemically important payment systems (SIPS) or system-wide important payment systems (SWIPS).</li> <li>(ii) Information-gathering powers over all payment system participants.</li> <li>(iii) The regulatory regime for SVFs.</li> </ul>



Payment instrument and/or institution	Legislation, regulations and bye-laws	Description
Real-time gross settlement (RTGS) system	<p><i>Section 29A of the Monetary Authority of Singapore Act (Chapter 186)</i></p> <p><i>Section 21 of the Payment and Settlement Systems (Finality and Netting) Act (Chapter 231)</i></p>	<p>This allows MAS to establish and operate one or more RTGS systems. MAS is responsible for the smooth operation of the RTGS system(s) and ensures that participants comply with the rules and regulations.</p> <p>MEPS+ is designated by MAS under the Payment and Settlement Systems (Finality and Netting) Act. All transactions settled by MEPS+ are thus final and irrevocable.</p>
Securities clearing and settlement systems	<i>Securities and Futures Act (SFA) (Chapter 289)</i>	MAS regulates CDP as a designated clearing house under the SFA.
Stored value facilities	<i>Payment Systems (Oversight) Act 2006: Part VII (Chapter 222A)</i>	This provides the legal framework for stored value facilities, with provisions for MAS to gather information from any issuer of SVFs.

<sup>1</sup> [Web link to Banking Act.](#) <sup>2</sup> [Web link to Payment Systems \(Oversight\) \(Singapore Dollar Cheque Clearing System And Inter-Bank GIRO System\) Regulations 2006.](#) <sup>3</sup> [Web link to Payment and Settlement Systems \(Finality and Netting\) Act.](#) <sup>4</sup> [Web link to Protocol for the Cooperative Oversight Arrangement of CLS.](#) <sup>5</sup> [Web link to Currency Act.](#) <sup>6</sup> External assets include gold and silver, among other assets, that can be stored locally in Singapore. <sup>7</sup> [Web link to Payment System \(Oversight\) Act.](#)

Other legislation that may be relevant to payment and settlement systems in Singapore includes the Bills of Exchange Act (Chapter 23), the Development Loan Act (Chapter 81), the Government Securities Act (Chapter 121A) and the Electronic Transactions Act (Chapter 88).

## 1.2 Role of MAS in payment, clearing and settlement systems

### 1.2.1 Settlement agent

MAS acts as a settlement agent for banks in Singapore by allowing funds transfers to take place across their RTGS accounts maintained in MEPS+. MAS also handles government-related payments and receivables that usually take the form of funds transfers between the government's accounts with MAS and with banks.

### 1.2.2 Operator

MAS operates MEPS+, a RTGS system which settles large-value interbank funds transfers (see Section 3.2). MEPS+ also handles the settlement of the cash leg of scripless SGS. Payment obligations that arise from trading in SGS and other Singapore dollar-denominated corporate debt between MEPS+ participants (which are typically banks in Singapore) are settled on a DVP basis through interfaces to the interbank funds transfer system in MEPS+ (see Section 4.2).

### 1.2.3 Overseer

MAS' oversight role for payment, clearing and settlement systems focuses on the objectives of safety and efficiency. With regard to safety, MAS seeks to ensure that payment, clearing

and settlement systems operate reliably without compromising financial stability. As for efficiency, MAS seeks to ensure that payment, clearing and settlement systems operate in a practical manner that is convenient for the users and efficient for the economy. In pursuing these objectives, MAS oversees both the operators and the participants in the payment, clearing and settlement systems. The main thrust of MAS' oversight is to ensure that the appropriate structures, processes and products are in place to safeguard stability and efficiency.

The PS(O)A is the cornerstone of MAS' payment systems oversight framework. It allows MAS to designate certain payment systems and subject them to its regulatory control. It also governs the issuance and management of SVFs.

A system is designated if it is considered a SIPS or a SWIPS. SIPS are systems where a failure or disruption can have an impact on the participants or cause wide systemic disruption in the financial system. SWIPS are systems where a failure or disruption in the system would not lead to systemic instability but could lead to widespread disruptions due to the large number of users relying on the system, thereby affecting public confidence. MAS' regulatory power over designated systems includes the power to request information, make regulations, inspect, investigate and establish an access regime.

MAS approval is also required for any multipurpose SVF (MPSVF) scheme with a total outstanding float of more than a prescribed threshold (currently SGD 30 million). In approving such a scheme, MAS requires the sponsoring bank(s) to be fully liable for the stored value. For all other MPSVFs, the holders of the stored value are required to disclose to potential users that they are not subject to MAS approval.

MAS regulates and supervises systemically important CCPs and securities settlement systems (SSSs) as designated clearing houses (DCHs) under the SFA and relevant subsidiary legislation, so as to reduce systemic risk and promote the safety and efficiency of clearing facilities that support systemically important markets or form an integral part of the financial infrastructure.

#### **1.2.4 Cooperation with other institutions**

MAS works with the industry to facilitate the development of Singapore's payment systems. It communicates with the industry regularly and conducts public consultations before implementing major regulatory changes. Examples of forums on payment system matters where MAS may participate are the Singapore Clearing House Association Management Committee and the Association of Banks in Singapore.

MAS also works closely with other government agencies when the operation of payment systems involves areas under their purview. For example, MAS works closely with the Ministry of Finance and the Infocomm Development Authority of Singapore on the promotion of e-payments and the introduction of new mobile payment methods. MAS also cooperates with foreign authorities in overseeing cross-border payment systems. For example, while CLS is a designated payment system under the Payment and Settlement Systems (Finality and Netting) Act, it is also overseen through an international cooperative oversight arrangement led by the Federal Reserve Bank of New York. MAS is a participating central bank in this mechanism for mutual assistance between central banks in their pursuit of shared public policy objectives for the safety and efficiency of payment and settlement systems.

### **1.3 The role of other private and public sector bodies**

#### **1.3.1 Singapore Clearing House Association (SCHA)**

The SCHA was formed in December 1980 to establish, manage and administer clearing services and facilities for the cheque, debit and credit items of its members. Membership is open to interested financial institutions and MAS. MAS chairs the SCHA.

The SCHA defines the bye-laws, rules and conditions governing the participating banks and operators of the SGDCCS, the USDCCS and the IBG system. It appoints the operator for the clearing systems and ensures that the operator provides the clearing services in accordance with the rules set by the SCHA, and that adequate business continuity arrangements are in place to manage risk of disruptions to the clearing services. In addition, the SCHA arbitrates disputes between members that may arise in connection with the clearing of cheques and GIRO items.

#### **1.3.2 Association of Banks in Singapore (ABS)**

The ABS is made up of member banks drawn from a wide spectrum of banks licensed by MAS. It represents the interests of its members, sets minimum standards of good practice, and supports projects of mutual benefit.

The ABS holds regular discussions with MAS regarding industry issues and the promotion of a sound financial system in Singapore. The ABS also provides input for legislation and guidelines relating to issues that affect the industry, including on payment and settlement systems.

### **1.4 The role of banks**

Commercial banks in Singapore may engage in a wide range of financial services, including traditional banking services such as loans and deposits, and investment banking business such as underwriting and distribution of equity and debt securities, corporate finance, fund management and unit trust management. As at end-September 2010, some 120 commercial banks were operating in Singapore, of which seven were locally incorporated.

Commercial banks are licensed under Chapter 19 of the Banking Act. Their activities are also governed by MAS' Notices to Banks and guidelines. Banks are currently the only institutions that may offer services across all segments of the payment process chain (issuing, acquiring, processing, clearing and settlement). However, new non-bank payment service providers are expected to play a greater role in the future.

## **2. Payment media**

### **2.1 Cash payments**

Cash remains the most widely accepted payment medium for small-value transactions. Under the Currency Act, MAS has the sole right to issue currency notes and coins in Singapore.

## **2.2 Non-cash payments**

### **2.2.1 Interbank GIRO**

The IBG system is an offline interbank payment system catering mainly for low-value bulk payments. IBG allows customers of participating banks to transfer funds via credit transfers and direct debits to and from the accounts of customers of any other participating bank. The net settlement amounts for IBG transactions are sent by the SACH to MEPS+ for settlement at the end of the day. In 2009, some 84.3 million eGIRO transactions were processed, up from 81.6 million in 2008. The value processed was SGD 218 billion, up from SGD 213 billion in 2008.

#### *2.2.1.1 Credit transfers*

In credit transfers, payers instruct their bank, physically or online, to debit their accounts and transfer the funds to the payee. In a standing order, payers instruct their bank to carry out the necessary transfers on a regular specific date, to a specific receiver and for a specific amount. Payroll crediting is the most common credit transfer. There is no maximum limit for each credit transfer.

In 2009, some 31.7 million credit transfer transactions were processed, up from 30 million in 2008. The value processed rose to SGD 158 billion, from SGD 153 billion in 2008.

#### *2.2.1.2 Direct debits*

Direct debit is an arrangement made by bank customers with a billing organisation (BO) to debit a designated bank account to pay regular bills (subject to an upper limit of SGD 25 million per direct debit). To set up a direct debit arrangement, customers sign a direct debit authorisation (DDA) form, which authorises their bank to allow the BO to initiate a regular collection instruction to deduct the required amount from a designated bank account. The signed DDA form is forwarded by the BO to the customer's bank for approval. Once it is approved, the BO issues instructions to its bank to collect bills from its direct debit customers. Examples of such preauthorised recurring payments are utility bill payments and payments for insurance premiums.

To facilitate faster processing of DDA forms, some banks tie up with their BOs to offer online DDA applications to customers with internet banking access. Other organisations allow DDA applications to be processed via EFTPOS terminals or through self-service kiosks such as the AXS stations.<sup>2</sup> These alternative DDA application methods allow DDA forms to be processed and approved more quickly.

In 2009, some 52.6 million direct debit transactions were processed, up from 51.5 million in 2008. The value processed was SGD 59 billion, the same as in 2008.

### **2.2.2 Cheques**

Cheques are commonly used in Singapore by consumers and businesses to charge or pay for goods and services. All banks in Singapore that clear SGD and local USD cheques use the Cheque Truncation System (CTS), an online image-based cheque clearing system introduced in 2003. Cheques are scanned into CTS when deposited at the bank, and their electronic images, rather than the physical cheques, are then transmitted through the clearing cycle. Cheque format has been standardised in the new system. More information on CTS can be found in Section 3.4.3.

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<sup>2</sup> AXS is the operator of an electronic service delivery network (ESDN) for self-service kiosks.

In 2009, some 78.2 million SGD cheques were processed, down from 82.5 million in 2008. The value processed was SGD 536 billion, down from SGD 579 billion in 2008.

In 2009, some 0.90 million USD cheques were processed, down from 0.96 million in 2008. The value processed was SGD 48.9 billion, down from SGD 52.2 billion in 2008.

### **2.2.3 Payment cards**

#### *2.2.3.1 Electronic money*

In Singapore, electronic money is also commonly known as a stored value facility (SVF). SVFs are classified as either single-purpose stored value facilities (SPSVFs) or as multipurpose stored value facilities (MPSVFs). SPSVFs are used to pay for goods and services offered by the issuer only (eg prepaid phone cards), while MPSVFs allow customers to pay for goods and services offered by other merchants or organisations.

Under the PS(O)A, any entity can issue SVFs without MAS approval provided that total outstanding stored value remains below a prescribed threshold (currently SGD 30 million). This regulatory regime liberalises the SVF market and allows for flexibility in meeting consumer needs and providing additional choice in payment methods. Any MPSVF with outstanding stored value of more than SGD 30 million requires MAS approval as a widely accepted SVF (WASVF), together with the appointment of an approved bank.<sup>3</sup> Singapore's four widely accepted MPSVF schemes are the NETS CashCard, NETS FlashPay, the EZ-Link card and the Singapore Youth Olympic Games DBS Visa Prepaid Card (SYOG PPC).

Launched in November 1996 by the three domestic banks, the NETS CashCard started out as a contact-based MPSVF. Contactless card interfaces were introduced in July 2006. CashCard lets consumers pay in a cashless manner at a variety of retail outlets, car parks and vending machines. It can also be used to pay toll charges at Electronic Road Pricing (ERP) gantries and the checkpoints between Singapore and Malaysia. In addition, the CashCard can be used for online purchases with the use of a card reader. The CashCard can be reloaded with amounts of up to SGD 500 at bank ATMs, selected EFTPOS terminals and self-service kiosks with NETS CashCard access, as well as over the internet.

The NETS FlashPay,<sup>4</sup> launched in October 2009, is a contactless CEPAS<sup>5</sup> MPSVF card issued by NETS. It is currently accepted on public transport and at some retail outlets. It can also be used to pay tolls at ERP gantries and car parks. The NETS FlashPay can be reloaded with amounts of up to SGD 500 at ATMs, ticket offices at Mass Rapid Transit (MRT) stations, bus interchanges, convenience stores and self-service iNETS kiosks with NETS FlashPay access.

The EZ-Link card, launched in April 2002, is a contactless MPSVF issued by EZ-Link Pte Ltd and is primarily used to pay for public transport. EZ-Link cards are also accepted in some schools and shops, and at food and beverage outlets. Since September 2009, all EZ-Link cards have been CEPAS-compliant. They can be reloaded with amounts of up to SGD 500 at ticketing machines or ticket offices at MRT stations, bus interchanges and other locations, as

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<sup>3</sup> The approved bank(s) will undertake to be fully liable for the outstanding stored value collected by the holder of the WASVF.

<sup>4</sup> Although both are issued by NETS, the NETS CashCard and NETS FlashPay run on different specifications and are not interoperable. NETS CashCard is contact-based and is used primarily for older-version in-vehicle units for toll charges. NETS FlashPay is CEPAS-compliant and can be used on the newer version in-vehicle units as well as for public transport.

<sup>5</sup> CEPAS, or Contactless ePurse Application, is Singapore's e-money standard. Its purpose is to facilitate interoperability of multipurpose stored value card payment schemes in the transit and other sectors.

well as over the internet. EZ-Link cards can also be reloaded automatically by linking them to a bank account or credit card account, so that funds are transferred to top up the EZ-Link Card whenever the stored value falls below a user-specified amount.

The DBS SYOG PPC, launched in March 2010, is a contactless MPSVF issued by DBS Bank Ltd. A proprietary form of a Visa Prepaid Card, its original purpose was to facilitate ease of payment for the officials, participants and spectators of the Singapore 2010 Youth Olympic Games. The SYOG PPC can be reloaded with amounts of up to SGD 500 at ATMs, selected retail outlets, and AXS self-service kiosks owned by DBS Bank, as well as over the internet. The cards continue to be valid after the Games.

The liberalisation of the SVF market has contributed to the emergence of many SPSVFs and limited-coverage MPSVFs, bringing about a substantial increase in SVF usage. From 2005 to 2009, the volume of electronic money transactions increased from 1.62 billion to 2.05 billion, while their value grew from SGD 1.42 billion to SGD 1.93 billion. Card take-up increased from 2.6 per capita in 2005 to 3.07 in 2009.

The launch of CEPAS brings consumers a significant step closer to the convenience of a single card for making transit, road toll and retail payments, as it can replace multiple cards for a variety of different purposes. When it is fully adopted, consumers will be able to use a single card seamlessly and safely in a wide range of payment scenarios. CEPAS will also allow a greater number of card issuers to participate in micro-payments.

#### 2.2.3.2 Automated teller machines (ATMs)

ATMs are another channel that allows bank customers to perform basic banking transactions without having to visit a branch. There were about 2,150 ATMs in Singapore in 2009, some 423 for every million inhabitants.<sup>6</sup>

Apart from depositing or withdrawing cash from their bank accounts, customers can use ATMs to apply for initial public offerings (IPOs), transfer funds to third parties, pay bills and reload their MPSVFs. The three major ATM networks in Singapore are the NETS OCBC-UOB network, the DBS-POSB network and the ATM 5 network.<sup>7</sup> Currently, ATMs are only interoperable within the respective ATM networks.

In 2009, some 204.8 million withdrawals with a total value of SGD 49.5 billion were made from ATMs.

#### 2.2.3.3 Debit cards

Debit cards are used to pay for goods and services or to withdraw cash. These transactions are effected through an online transfer of funds from the cardholder's bank or debit card account. Debit cards in Singapore are either PIN- or signature-based.

Examples of PIN-based debit cards are NETS EFTPOS and EPINS debit cards, with the former predominating. These cards let cardholders make payments for retail purchases at EFTPOS terminals or withdraw cash from their bank accounts at ATMs. Visa Debit and the Debit MasterCard are examples of signature-based debit cards.

In 2009, the number of debit card transactions rose to 205.1 million, from 182.4 million in 2008. The value processed was SGD 22.4 billion, up from SGD 20.5 billion in 2008.

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<sup>6</sup> Population as at end-2009 from Department of Statistics Singapore.

<sup>7</sup> The ATM 5 network is run by MasterCard for six qualifying full banks: Citibank, Maybank, HSBC, Standard Chartered, ANZ and State Bank of India.

NETS introduced the EFTPOS service in 1986. ATM cards<sup>8</sup> issued by participating banks have a debit card function that lets cardholders pay for goods and services through an online transfer of funds from their accounts. EFTPOS terminals are available at government departments and major supermarkets, department stores, petrol stations, and a large number of smaller retail outlets. A cashback feature was added in 2001, allowing consumers to withdraw cash at the point of sale.

Since 2005, it has been possible to use China UnionPay (CUP) debit cards directly at NETS EFTPOS terminals in Singapore. CUP cardholders can also withdraw cash from a network of more than 1,500 ATMs operated by the local banks in Singapore.

In June 2010, Card Alliance Pte Ltd (Card Alliance) launched EPINS, a PIN-based debit payment service. Customers of partnering qualifying full banks (QFBs) can pay for their purchases with their ATM/debit cards at any of the merchant locations accepting EPINS debit payments in Singapore.

When the cardholder pays for a purchase with a PIN-based debit card, the issuer verifies the transaction and debits the cardholder's account accordingly before providing authorisation to the merchant through the EFTPOS network. The EFTPOS network settles the net debit and credit positions of the participating financial institutions through the settlement bank at the end of the day.

When the cardholder pays for a purchase with a signature-based debit card, the merchant submits the transaction to the acquirer, who verifies with the issuer through the card scheme operator. Once the issuer has verified that both the card number and transaction amount are valid, the merchant will process the transaction. After the transaction is authorised by the issuer, it is stored in a batch that the merchant later sends to the acquirer to receive payment (usually at the end of the day). The acquirer then sends the transactions in the batch to the card association, which debits the issuers for payment and credits the acquirer through its settlement bank.

All end-of-day transactions between the issuer and acquirer are conducted through the IBG.

#### 2.2.3.4 Credit cards

All major credit card brands, such as American Express, CUP, JCB, MasterCard and Visa, are issued and accepted in Singapore. The issuance of credit cards is subject to MAS guidelines and to regulations on, for example, income eligibility criteria and credit card marketing. With effect from 1 March 2009, MAS lowered the gross minimum income threshold for unsecured credit facilities from SGD 30,000 to SGD 20,000. However, this lower limit does not apply to credit cards, for which the threshold remains unchanged at SGD 30,000 for individuals at or below 55 years of age and SGD 15,000 for individuals above 55 years of age. The maximum aggregated credit limit for all unsecured personal credit facilities and credit or charge cards granted by individual financial institutions has also been revised and set at four times monthly income for individuals with at least SGD 30,000 in annual income. For individuals with annual income between SGD 20,000 and SGD 30,000, the maximum aggregated credit limit is twice monthly income. The unsecured lending provisions do not apply to high net worth Singaporean or permanent residents earning at least SGD 120,000 per annum and non-Singaporeans/permanent residents. Such individuals can qualify for unsecured credit in unrestricted amounts.

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<sup>8</sup> A debit card allows the customer to access funds in a deposit account with a financial institution and to make payment for goods and services. ATM cards are a subset of debit cards that only let the customer access the financial institution's ATMs (or ATM network) and cash deposit machines.

The value of credit card transactions processed rose to SGD 26 billion in 2009, from SGD 25.7 billion in 2008.

## **2.2.4 Other access channels for banking and payments**

### *2.2.4.1 Telephone banking*

Since the introduction of phone banking in 1982, the range of services offered has increased. Besides being able to transfer funds from person to person and conduct account balance enquiries over the telephone, bank customers can also make bill payments, trade in stocks and bid for Certificates of Entitlement.<sup>9</sup>

### *2.2.4.2 Mobile banking*

Banking services have been available via mobile phones since the early 2000s. Some online purchases can be made via mobile phone instead of credit card. One payment method requires users to register their credit card account details with their mobile payment service provider. After payments are authenticated by means of an ID and PIN, they are processed as a credit card transaction. Another method charges the payment to the user's phone bill. Mobile payment solutions linked to a bank account are currently not widely available.

In June 2010, PayPal was selected by the Infocomm Development Authority (IDA) to be the mobile payment platform for the Singapore Digital Concierge, one of the key programmes in the IDA's 10-year Intelligent Nation Masterplan (iN2015) for the tourism, hospitality and retail sectors. The PayPal-IDA collaboration seeks to accelerate the growth of mobile commerce, making it easier for businesses and consumers to pay for goods and services securely via mobile phone.

### *2.2.4.3 Internet banking*

Internet banking allows consumers to conduct account balance enquiries, fixed deposit placements,<sup>10</sup> demand draft applications<sup>11</sup> and loan applications. In addition, payment services such as funds transfers (including transfers to third parties' accounts with other banks) and bill payments are available.

A number of banks have also launched internet payment services that let consumers pay for internet purchases by directly debiting their bank accounts. In addition, there are several online payment portals operating in Singapore. Internet banking services are proprietary and offered by banks individually.

MAS has issued guidelines to assist banks in establishing a sound and robust technology risk management framework to strengthen system security, reliability, availability and recoverability as well as deploy strong cryptography and authentication mechanisms to protect customer data and transactions. MAS encourages banks to adopt two-factor authentication (2FA) to enhance security and raise user confidence. A common 2FA implementation is the use of one-time passwords (OTPs) that are generated by a hardware token or sent by SMS to the customer's mobile phone.

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<sup>9</sup> The Certificates of Entitlement (COE) system requires Singapore residents to bid for the right to buy a motor vehicle, with the number of certificates deliberately restricted. The COE allows holders to own a car for a period of 10 years in Singapore, after which they must either scrap or export their car with financial incentives, or bid for another COE at the prevailing rate if they wish to continue using their car for a further five or 10 years.

<sup>10</sup> Transferring funds (eg from a savings account) to a fixed deposit account.

<sup>11</sup> A demand draft allows the user to transfer funds to another account.



#### 2.2.4.4 Self-service machines

Following on from the ATMs that have allowed the public do their own banking since the 1980s, general self-service machines that are accessed with debit cards have gained in popularity since they were first launched in 2000. They can now be used to pay bills, buy movie tickets, book chalets, subscribe to magazines, reload stored value cards and even make donations to charity. Although self-service machines were slow to take off, incremental improvements and the greater reliability of the present generation of machines have resulted in steady growth. The two main self-service machine networks, AXS and SAM,<sup>12</sup> now have more than 750 installations across the country, capturing up to 20% of recurrent bill payment volume.

### 3. Payment systems (funds transfer systems)

#### 3.1 General overview

The key payment and clearing functions in Singapore are provided by a small number of major organisations.

1. MAS operates MEPS+, the settlement system for large-value interbank fund transfers. Payment obligations that arise from trading in SGS and in other SGD-denominated corporate debt are settled on a DVP basis via interfaces to the interbank funds transfer system in MEPS+ (see Section 4.2).
2. CLS settles foreign exchange (FX) transactions in 17 currencies including the Singapore dollar on a payment versus payment (PVP) basis, thereby eliminating FX settlement risk and providing netting efficiencies of up to 90% (see Section 3.3.1 for details of CLS). The three local banks in Singapore interface with CLS via a shared utility operated by the Clearing and Payment Services Pte Ltd (CAPS). Foreign exchange (FX) settlement of 17 major currencies occurs via the CLS system on a PVP basis. This system provides for greater efficiency in FX settlement with netting efficiencies of up to 90%. Singapore's three local banks connect to CLS Bank via CAPS using a single connection, rather than via direct connections between individual banks and CLS.
3. The SCHA provides three clearing systems for its member banks:
  - (i) SGDCCS;
  - (ii) USDCCS; and
  - (iii) IBG.

The SCHA provides SGD and USD cheque and interbank GIRO clearing services for its members through the SACH, which is operated by BCS. Banks' net obligations arising from the SGD Cheque Clearing System and the interbank GIRO system are settled through MEPS+ on a deferred same day basis. The settlement files are prepared by the SACH and sent to MEPS+ electronically at stipulated times.

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<sup>12</sup> The two networks are typically not interoperable. Some merchants are linked to only one network. But both machines accept NETS EFTPOS as a form of payment. SAM stands for Self-service Automated Machine and is operated by Singapore Post.

Net obligations arising from the USD Cheque Clearing System are settled across participants' accounts held with Citibank, the settlement bank for USDCCS. The SACH prepares and sends the settlement files to Citibank at a stipulated time each working day.

4. Banks in Singapore operate about 2,150 ATMs. The major ATM networks in Singapore are:
- (i) the DBS-POSB ATM network;
  - (ii) the NETS OCBC-UOB network; and
  - (iii) the MasterCard ATM 5 network.

DBS-POSB customers can make cash withdrawals at any ATM in the DBS-POSB ATM network.

UOB and OCBC share their ATM network; the customers of one bank can withdraw money from the other's ATMs. Cash withdrawals are free from a customer's own bank, but a charge is levied after two withdrawals per month from the partner bank.

MasterCard ATM 5 lets customers make cash withdrawals at no charge for all ATMs in the network. It includes ATMs shared among six foreign banks: Citibank, Maybank, HSBC, Standard Chartered, Australia and New Zealand Banking Group Limited and the State Bank of India. For these banks, the customers have access to the shared ATMs in the network plus proprietary ATMs which can only be used by customers from the specific bank.

### **3.2 New MAS Electronic Payment System (MEPS+)**

MEPS+ is an RTGS system developed for large-value SGD interbank funds transfers and the settlement of scripless SGS transactions. MEPS+ consists of two subsystems, namely MEPS+ Interbank Funds Transfer (MEPS+-IFT) and MEPS+-SGS. MEPS+-SGS is described in more detail in Section 4.3.1.

An important feature of MEPS+ is the real-time and irrevocable transfer of funds and SGS. The settlement of the cash leg of SGD-denominated corporate and other government debt instruments can also be made through MEPS+ on a DVP basis.

Banks' current accounts held with MAS are structured to facilitate RTGS payments. At the start of the day at 06:00, funds maintained with MAS in the current account are transferred to the RTGS account, where they may be used for the settlement of MEPS+ payments from 09:00 to 19:00. Where an intraday Minimum Cash Balance (MCB)<sup>13</sup> requirement applies to a bank, only funds in excess of its intraday MCB requirement are transferred to the RTGS account from which funds are used for settlement.

MEPS+ is considered an SIPS and is designated under the PS(O)A.

#### **3.2.1 Operating rules**

MEPS+ is owned and operated by MAS. All participating banks are contractually bound to operate in compliance with the MEPS+ operating rules and regulations. The operating rules

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<sup>13</sup> Under Section 39 of the Banking Act, all banks in Singapore are required to maintain an MCB with MAS calculated as an average fortnightly amount. On a day-to-day basis, a bank's closing MCB is allowed to vary within a band of 1% above or below the required 3% MCB, ie the closing MCB on any day should not drop below 2% of the liabilities base and any balance above 4% will not be counted towards the fortnightly average. The average closing MCB held over the fortnightly maintenance period must be at least 3% of the liabilities base.

cover areas such as general duties and responsibilities of the service provider and participants, as well as gridlock resolution, queue management and backup facilities.<sup>14</sup>

The regular weekday operating hours of MEPS+ are as follows:

<b>Time</b>	<b>System status</b>
06:00:00–08:59:59	System accepts forward-dated transactions only
09:00:00–19:00:00	System accepts same day value and forward-dated transactions
19:00:01–20:00:00	System accepts forward-dated transactions only

### **3.2.2 System participants**

All banks, local and foreign, licensed under the Banking Act are eligible to participate directly in MEPS+. Regulated non-banks of systemic importance may also seek approval from MAS to participate in MEPS+. Banks with small SGD payment volumes may choose not to participate in the system and, instead, to appoint a participating bank as their agent. While the terms of such agreements are negotiated bilaterally between the banks, and are outside the scope of MEPS+, MAS provides some services for these non-participating banks so that they can transfer funds and SGS from their MAS current accounts and SGS-Minimum Liquid Assets<sup>15</sup> (MLA) accounts, respectively. All banks licensed in Singapore hold a current account with MAS. MEPS+ participant banks can transfer funds from their current accounts to the RTGS account for settlement. There were 63 participating banks in MEPS+ at end-2009.

### **3.2.3 Types of transactions handled**

MEPS+ is designed to facilitate large-value SGD interbank funds transfers and to settle scripless SGS transactions on a DVP basis. In addition, it also maintains a real-time system link to the SGX Debt Securities Clearing and Settlement System (DCSS) for the cash leg settlement of listed SGD corporate debt securities on a DVP basis.

### **3.2.4 Operation of the transfer system and the transaction processing environment**

As MEPS+ is based on SWIFT infrastructure, participants use their existing SWIFT terminals and interfaces to submit payment instructions, manage queued transactions and perform online enquiries. Submitted payment instructions that fail to settle due to insufficient funds in a participant's account are queued with priority assigned by the participating bank. All queued instructions are settled according to their assigned priority levels on a first-in-first-out basis. Queued payments which cannot be processed at the end of a business day are cancelled and affected participants informed of such cancelled payments through appropriate SWIFT messages.

Some features of MEPS+:

- the use of SWIFT message formats, the SWIFT network and existing infrastructure at banks to streamline back office and cash management operations, increase straight through processing and reduce training, message translation and repair costs;

<sup>14</sup> [Web link to the MEPS+ service agreement.](#)

<sup>15</sup> Under Section 38 of the Banking Act, as part of the MLA requirements, all banks in Singapore must hold SGS equal to at least 10% of total liabilities, of which 5% must be outright holdings of SGS. The remaining SGS may be held under reverse repo transactions.

- parameterised queue management, to provide participants with advanced queue management capabilities for better liquidity and settlement risk management and increased efficiency;
- automated collateralised intraday liquidity facilities, to enable participants, particularly banks with low liquidity, to settle payments more efficiently and to increase system payments flow; and
- automated gridlock resolution, which detects and resolves gridlocks to prevent or reduce payment queues and to increase overall payments flow efficiency.

To mitigate operational risks, business continuity and disaster recovery plans are established and regularly tested by both MAS and participants. In addition, MEPS+ and participants' SWIFT systems are subject to periodic operational and technical audits by MAS' Internal Audit Department and MAS' bank examiners, respectively.

### **3.2.5 Settlement procedures**

Under the MEPS+-IFT subsystem, interbank funds transfers are made using SWIFT messages. Provided the paying bank has sufficient funds in its RTGS account, its same day payment instructions will be settled instantaneously and irrevocably.

MEPS+-IFT processes only same day value transactions. However, the system also accepts forward-dated transactions up to 14 working days ahead. Such forward-dated transactions are stored in the system and processed on the actual value date.

### **3.2.6 Credit and liquidity risks and their management**

To mitigate settlement risk, MAS allows banks to use the full amount of their reserves in excess of any MCB requirements imposed on an intraday basis. Participants may also request additional liquidity on an intraday basis through the use of automated collateralised intraday liquidity facilities. The intraday liquidity facilities are available only on business days and during MEPS+ operating hours. The availability of the intraday liquidity facility and the cutoff time for liquidity reversals are set out below:

<b>Activity</b>	<b>Monday–Friday</b>
Opening of facility	09:00
Close of facility	17:00
Liquidity reversals	17:30

Participants may be required to pay interest for each intraday repo transaction that is effected. MAS may from time to time notify the participant on the interest rate charged either through an announcement in MEPS+ or a general announcement on the MAS website. Currently, no interest is charged for usage of the intraday liquidity facility.

With effect from 24 July 2008, a MEPS+ participant may borrow SGD funds from MAS on an intraday and overnight basis by entering into an SGS repurchase transaction, if they have signed the PSA/ISMA Global Master Repurchase Agreement with MAS and deposit SGD funds with MAS on an overnight basis.

### **3.2.7 Pricing policies**

Fees and charges for MEPS+ participation and usage are set out in the MEPS+ Service Agreement and are reviewed periodically by MAS. MEPS+ participants are charged on a cost recovery basis, and the fees for the various components are as follows:

### MEPS+ pricing framework

#### (i) Time-based transaction charges

The MEPS+ pricing structure aims to improve payment safety and efficiency by encouraging banks to pay early in the day.

Settlement time band per transaction charge<sup>1</sup>

09:00–14:30	SGD 1.45
14:31–16:00	SGD 1.70
16:01–17:30	SGD 2.50
17:31–18:30	SGD 5.00

#### (ii) End-of-day statement messages

End-of-day statements<sup>2</sup> contain all the transactions and daily closing positions of participants. Participants are charged SGD 0.20 per SWIFT statement message to reimburse MAS for the SWIFT messaging costs incurred by MEPS+.

#### (iii) Annual subscription fee

Fee tiering is based on the assumption that banks with licences that allow for a wider range of banking activities derive more benefit from participating in MEPS+. This is because MEPS+ services can be used for the various banking activities offered.

<b>Bank category</b> <sup>3</sup>	<b>Annual subscription fee</b>
Local banks	SGD 16,000
Qualifying full banks	SGD 13,000
Full banks	SGD 7,500
Wholesale banks	SGD 2,000
Offshore banks	SGD 750
Clearing and settlement systems	SGD 2,000

#### (iv) Manual contingency charges

Manual contingency is a service provided by MAS for participants prevented by system failures from effecting payments or SGS transactions. MEPS+ has two manual contingency modes, one relying on the participant's instructions sent via MASNET, which is a secure e-mail network between financial institutions and MAS, and the other being a manual input mode. Both modes are subject to a SGD 100 per day activation fee to ensure that banks do not frivolously resort to the contingency mode. Each transaction submitted using MASNET is charged SGD 5 per transaction, the lower rate reflecting the greater efficiency compared with manual key-in.

<b>MASNET</b>	<b>Manual key-in</b>
SGD 100 activation fee (per day if used)	SGD 100 activation fee (per day if used)
SGD 5 per transaction	SGD 10 per transaction

<sup>1</sup> The charges below apply only to the bank sending a transaction. The receiving bank is not charged a fee.

<sup>2</sup> Participants can also log in to the system to monitor their payment flows during the day. <sup>3</sup> [Web link to an explanation of the various banking licences.](#)

### **3.3 Foreign exchange (FX) settlement systems**

#### **3.3.1 Continuous Linked Settlement (CLS)**

CLS allows cross-border currency transactions to be settled on a PVP basis. It is a real-time, global settlement system that eliminates the FX settlement risk arising from delays in settlement across time zones. The CLS service is offered by CLS Bank International<sup>16</sup> (CLS Bank), which links to the RTGS systems operated by central banks in 17 currencies.<sup>17</sup>

The CLS system offers greater liquidity efficiency, as it requires funding only of the netted values of the FX trades. As opposed to the correspondent banking model where full funding of the gross FX trade values is required, netting in CLS allows banks to manage their liquidity more efficiently, leading to reduced funding requirements and costs.

#### **3.3.2 Clearing and Payment Services Pte Ltd (CAPS)**

Incorporated in 2001, CAPS is a shared utility service owned and used by the three local banks, namely DBS, UOB and OCBC, to connect to CLS. DBS, UOB and OCBC are the Singaporean CLS members and CAPS, which is not a CLS member, merely acts as a link between the three local banks and CLS. It is the world's first collaborative payment utility designed to reduce CLS integration and operating costs. This initiative differs from the majority of the CLS settlement member banks, which have traditionally built direct connections to CLS Bank. Banks send their CLS foreign exchange trades to CAPS in a format of their choosing, where they are transformed into a CLS-compliant format for onward submission to CLS. CAPS essentially forms a link between its customer banks and CLS, achieving scale and efficiency economies for the participating banks.

### **3.4 Retail payment systems**

#### **3.4.1 Singapore Dollar Cheque Clearing System (SGDCCS)**

The operator of the SGDCCS is BCS. Direct participation in the SGDCCS is available only to ordinary SCHA members. Associate members can participate indirectly in the SGDCCS using a direct participating bank as their clearing agent. The SGDCCS is designated under the Payment and Settlement Systems (Finality and Netting) Act.

#### **3.4.2 USDollar Cheque Clearing System (USDCCS)**

The USDCCS was launched in 1996 to clear and settle US dollar-denominated cheques drawn on banks in Singapore. BCS is the appointed clearing operator and Citibank the settlement bank.<sup>18</sup> For the settlement of USD cheques, participating banks must maintain USD accounts with Citibank. In May 2010, the settlement method for USD cheques was changed from aggregated gross basis to a netted basis similar to that of SGDCCS. The netted settlement has resulted in significant liquidity savings for participants, and also

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<sup>16</sup> CLS Bank is based in New York and is an Edge Corporation bank supervised by the Federal Reserve. CLS Services Pte Ltd is the operations arm of the CLS group and is located in London.

<sup>17</sup> US dollar, euro, sterling, Japanese yen, Swiss franc, Canadian dollar, Australian dollar, Swedish krona, Danish krone, Norwegian krone, Singapore dollar, Hong Kong dollar, New Zealand dollar, Korean won, South African rand, Israeli shekel and Mexican peso. For more details on CLS, see the corresponding chapter in the forthcoming second volume of this publication.

<sup>18</sup> A tender is carried out every five years to appoint the operator and settlement bank.

mitigates banks' exposure to the settlement bank. The USDCCS is designated under the Payment and Settlement Systems (Finality and Netting) Act.

### **3.4.3 Cheque Truncation System (CTS)**

In July 2003, banks in Singapore migrated to a new cheque clearing system, known as the CTS. Both SGD- and USD-denominated cheques presented to and drawn on banks in Singapore are cleared through CTS. CTS originated as an initiative from the SCHA and the ABS to enhance the operational efficiencies of the banking industry. CTS is the world's first nationwide end-to-end cheque truncation system. It uses imaging and internet technologies to scan cheques at the point of deposit and transmit the images over a secured communication network. Physical movement of paper cheques has given way to digital information, resulting in a more efficient, one-day cheque clearing cycle.

The clearing and settlement process of an SGD cheque is as follows:

1. The payer sends a cheque to the payee.
2. The payee deposits the cheque at the presenting bank (payee's bank), which credits the payee's account provisionally ("on hold" cheques).
3. The presenting bank captures the cheque images and magnetic ink character recognition (MICR) data before transmitting them electronically to the SACH via a secured private network.
4. After clearing the cheques and determining the net settlement amount for each participating bank, the SACH sends the net clearing figures to MEPS+, which in turn transmits the figures to the participating banks before performing settlement by debiting and crediting the participating banks' settlement accounts.
5. The SACH processes and sorts the data, and makes them available electronically for downloading and processing by the paying banks.
6. If the paying bank (payer's bank) rejects a cheque, it returns the unpaid cheque images and MICR data to the presenting bank through the SACH on the next business day.
7. The settlement amount for both paying and presenting banks is adjusted accordingly by the SACH in the figure sent to MEPS+ that day.
8. If the cheque is cleared successfully, the payee can withdraw the "on hold" funds after 14:00 on the second business day.

The SACH transmits the multilateral net positions of all direct and indirect participants to MEPS+ twice a day. Midday multilateral net settlement positions are made known to participating banks at 15:05, and net debit banks have until 15:45 to fund their MEPS+ accounts. End-of-day multilateral net settlement positions are made known to participating banks at 18:15, and banks have until 18:45 to fund any net debit positions.

The clearing process for USD cheques is similar to that of SGD cheques. However, there is only one settlement per day across participating banks' accounts with the settlement bank, Citibank.

If any participating bank fails to settle its obligations by the deadline specified, it is considered to be in default and may be suspended from clearing. This means that it can no longer present cheques and no other participating banks can present cheques drawn on the suspended bank. The SACH will recast figures of all participating banks and exclude those of the suspended bank. MAS may allow the suspended bank to be readmitted if it demonstrates that it can take steps to ensure that its obligations arising out of the clearing can be fulfilled.

Pursuant to the PS(O)A, in an emergency situation MAS may assume control of and carry on the operations of the clearing system or the settlement bank, or direct some other person to do so on behalf of MAS.

#### **3.4.4 Interbank GIRO (IBG)**

IBG is a paperless system that lets customers of participating banks transfer funds, via direct debits and credit transfers, to and from the accounts of customers of any other participating bank. In July 2001, the SACH, the IBG's operator, upgraded the IBG system to a browser-based system called eGIRO, thus eliminating the physical transfer of magnetic tapes between participating banks and the SACH. Participating banks can now electronically send and receive IBG items, including returned and rejected items, via a secure communication network on a same day basis.

In December 2008, an enhanced eGIRO system, known as eGIRO+, which makes use of the existing eGIRO network infrastructure, was piloted by some of the participating banks. Its features include an extended clearing window for submission of files to the SACH as well as the capability to receive files from the SACH via straight through processing.

There is only one settlement session for IBG payment instructions including eGIRO+ transactions. End-of-day multilateral net settlement positions are broadcast across MEPS+ at 18:15, and banks have until 18:45 to fund any net debit positions.

IBG is designated under the Payment and Settlement Systems (Finality and Netting) Act.

Any participating bank that fails to settle its obligations by the deadline specified in the rules of the settlement bank can be excluded from settlement. As with the SGD and USD Cheque Clearing System, a recasting process will then take place.

#### **3.4.5 ATM networks**

Most banks in Singapore have proprietary ATM networks, but there are linkages between these networks to provide consumers with wider access. There are currently three major ATM networks in Singapore:

- the POSB-DBS ATM network, which was established following the merger of POSB and DBS in 1998. This network is a proprietary intrabank network run by DBS;
- the NETS OCBC-UOB ATM network, a shared interbank ATM network of the other two local banks (UOB and OCBC); and
- the MasterCard ATM 5 network. This is a shared network of six QFBs, with the switching done by MasterCard.<sup>19</sup>

For transactions using the NETS OCBC-UOB ATM network, the switching is done by NETS. When a cardholder performs a transaction at an ATM of another bank, NETS switches the transaction to the issuing bank for authorisation, which involves verification of the PIN, checking that sufficient funds are available and authenticating the transaction. The issuing bank then sends its response back via NETS, which switches it to the ATM being used, and the transaction is completed.

If cardholders perform transactions at their own bank's ATMs, these require no switching, as the issuing bank is able to approve them directly.

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<sup>19</sup> The ATM 5 network consists of Citibank, Maybank, HSBC, Standard Chartered Bank, ANZ and State Bank of India.



During clearing, NETS calculates the bilateral net settlement positions for each member bank. The net amount is then provided to the settlement bank, DBS Bank, for direct debiting or crediting of the member banks' accounts maintained with DBS Bank. Member banks manage their nostro accounts at DBS Bank through MEPS+.

Cirrus and Plus cash withdrawals are cleared by MasterCard and Visa, respectively, on a similar principle to NETS. When currency conversion is performed, the exchange rates are determined by MasterCard and Visa on a daily basis. Settlement for these transactions is conducted through the settlement banks for the respective card schemes.

## **4. Systems for post-trade processing, clearing and securities settlement**

### **4.1 General overview**

The three main providers of post-trade services in Singapore are MAS, the CDP and SGX-DC. Both the CDP and SGX-DC are wholly owned subsidiaries of SGX.

1. The MEPS+-SGS subsystem at MAS clears and settles SGS trades on a DVP basis.
2. The CDP is the CSD and SSS for Singapore equities, corporate debt securities and other securities. CDP also provides CCP clearing for Singapore equities. CDP operates two systems :
  - (i) the CDP Clearing & Settlement System (C&S), which is used to clear and settle securities trades executed on the trading platform of Singapore Exchange Securities Trading (SGX-ST); and
  - (ii) the Debt Securities Clearing and Settlement System (DCSS), a gross DVP settlement system used for the settlement of transactions in the over-the-counter (OTC) market for private bonds. No netting is carried out.
3. SGX-DC provides CCP clearing and settlement for all derivatives contracts traded on the Singapore Exchange Derivatives Trading Ltd (SGX-DT), and for certain classes of OTC derivatives contracts such as oil and coal swaps and freight forward agreements.

There are currently no dedicated trade confirmation systems or trade repositories operating in Singapore.

### **4.2 Central counterparties and clearing systems**

#### **4.2.1 CDP**

##### *4.2.1.1 Institutional framework*

CDP is a designated clearing house regulated under the SFA and its relevant subsidiary legislation. The CDP clearing rules and DVP rules govern its operations, its admission requirements and the ongoing obligations of its members.

##### *4.2.1.2 Participation*

Participation in CDP is restricted to clearing members, who must meet minimum membership criteria such as base capital and ongoing risk-based capital requirements. CDP had 25 clearing members as at October 2010, comprising broker-dealers and banks.

#### 4.2.1.3 Types of transactions

CDP clears and settles equities, structured warrants, company warrants, corporate bonds, extended settlement contracts, real estate investment trusts (REITs), exchange-traded funds (ETFs), exchange-traded notes (ETNs), business trusts, American depository receipts (ADRs) and global depository receipts (GDRs) that are traded on SGX-ST.

#### 4.2.1.4 Operation of the system

CDP begins the clearing process with trade matching, which occurs immediately on execution of the trade in the SGX-ST trading engine, Quotation and Execution System for Trading (QUEST-ST), a fully automated trading platform. Once the trade is matched, CDP becomes the CCP to each side of the transaction through novation, thus guaranteeing performance to the brokers on each side of the trade. On T+1, CDP informs each clearing member of its money and securities obligations.

Trades are settled on CDP in a T+3 settlement cycle, with securities settled on a gross basis while cash is settled on a net basis. For securities settlement, CDP debits the securities from the selling broker's clearing account and credits the buying broker's clearing account. For cash settlement, each clearing member has to maintain an account with any of the six CDP-authorized settlement banks. CDP maintains an account with each settlement bank in addition to an account with its clearing bank.<sup>20</sup> On the due date, CDP issues debit and credit instructions to each settlement bank. The buying clearing member's account will be debited and funds will be credited to CDP's account. Subsequently, the settlement bank will debit CDP's account and make payment to the selling clearing member.

#### 4.2.1.5 Risk management

CDP maintains rules to ensure that clearing members maintain adequate controls and sufficient financial resources to meet their obligations to CDP. Clearing members are subject to close supervision and inspection, and their settlement obligations are monitored daily.

CDP also maintains a clearing fund that is applied if a clearing member is unable to discharge its financial obligations to CDP. All clearing members are required to contribute to the clearing fund, with contributions varying in proportion to the clearing member's traded volume. CDP also contributes to the clearing fund and maintains a standby credit line.

If a clearing member defaults, CDP first applies any collateral or security deposit placed by the defaulting member with CDP. If these funds are insufficient, CDP applies the clearing fund in the following order:

- contributions to the clearing fund made by the defaulting member;
- CDP's contributions to the clearing fund;
- contributions made by all other clearing members, on a pro rata basis; and
- CDP's standby line of credit.

If the clearing fund is insufficient to cover the discharge of financial obligations, CDP will use its capital to cover any additional losses.

#### 4.2.1.6 Pricing

CDP charges clearing fees of 4 basis points of contract value, subject to a cap of SGD 600 per contract.

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<sup>20</sup> The clearing bank acts as a payment and collection agent on CDP's behalf to handle money settlement between settlement banks. The clearing bank also guarantees CDP against a default by a settlement bank.

#### 4.2.1.7 *Links to other systems*

CDP does not link to other CCP systems.

#### 4.2.1.8 *Major ongoing and future projects*

CDP is launching a link to MEPS+ for settlement of SGD transactions. When completed, the clearing bank will no longer act as a payment and collection agent for CDP, but will continue to guarantee CDP against a default by a settlement bank.

### 4.2.2 **SGX-DC**

#### 4.2.2.1 *Institutional framework*

SGX-DC is a designated clearing house, regulated under the SFA and relevant subsidiary legislation. The SGX-DC clearing rules govern its operations, its admission requirements and the ongoing obligations of its members.

#### 4.2.2.2 *Participation*

Participation in SGX-DC is restricted to clearing members, who must meet minimum membership criteria such as base capital and ongoing risk-based capital requirements. SGX-DC had 24 clearing members as at October 2010, comprising broker-dealers and banks.

#### 4.2.2.3 *Types of transactions*

SGX-DC clears futures and options contracts on interest rates, stock indices, dividend indices and commodities traded on SGX-DT, and OTC derivatives contracts such as oil and coal swaps and freight forward agreements.

#### 4.2.2.4 *Operation of the system*

SGX-DC operates SGXClear, the system used to clear derivative products traded on SGX-DT. SGX-DC acts as the CCP to all executed trades. Novation occurs as soon as a trade is matched in SGX-DT's trading engine, QUEST-DT. As a consequence, all financial obligations arising from the trade are guaranteed by SGX-DC.

SGX-DC revalues all open positions on a daily basis based on the latest market prices and computes the gains and losses of all open positions. Margin calls are made on the clearing member if existing margins held with SGX-DC are inadequate. Similarly, the clearing member has to pay for computed mark to market losses on open positions. There are four clearing cycles, and debit instructions are sent to SGX-DC's settlement banks to instruct them to debit clearing members' accounts for mark to market losses and margin calls. On receiving these settlement instructions, each settlement bank is required to confirm to SGX-DC by a stipulated deadline via SWIFT that it is able to carry out the instructions.

#### 4.2.2.5 *Risk management*

SGX-DC's safeguards for its clearing process include an effective margin system for contracts cleared, daily marking to market of outstanding positions, an adequate clearing fund based on daily stress testing of members' outstanding positions, and ongoing supervision of members to ensure their financial adequacy.

If a clearing member defaults, SGX-DC will first apply any collateral, margins or security deposits placed by the clearing member with SGX-DC. If these funds are insufficient, SGX-DC will apply the clearing fund in the following order:

- SGX-DC's contributions to the clearing fund, up to 15% of the total clearing fund size;
- contributions to the clearing fund made by other members clearing the same contracts as the defaulting members, on a pro rata basis;
- the remainder of SGX-DC's contributions to the clearing fund; and
- contributions to the clearing fund made by all other members, on a pro rata basis.

If the clearing fund is insufficient to cover the discharge of financial obligations, SGX-DC will use its capital to cover any additional losses.

#### 4.2.2.6 *Links to other systems*

An inter-exchange allocation functionality is available in SGXClear to allow clearing members to allocate trades to clearing members of the Chicago Mercantile Exchange (CME) on a real-time basis. In addition, clearing members can accept incoming CME trades in real time.

#### 4.2.2.7 *Major ongoing and future projects*

SGX-DC is launching a new clearing service for OTC financial derivatives, starting with the clearing of interest rate swaps denominated in Singapore and US dollars.

### 4.3 **Securities settlement systems**

#### 4.3.1 **MEPS+-SGS**

##### 4.3.1.1 *Institutional framework*

MEPS+-SGS is governed by the same institutional framework as MEPS+. Details can be found in Section 3.2.1.

##### 4.3.1.2 *Participation*

The eligibility criteria for participating in MEPS+-SGS are the same as for MEPS+. Details can be found in Section 3.2.2.

##### 4.3.1.3 *Types of transactions*

MEPS+-SGS settles scripless SGS transactions on a DVP basis. Participants in the MEPS+-SGS subsystem may hold the following accounts, depending on the type of financial institution:

- *Trade account*  
SGS holdings in excess of minimum MLA requirements are maintained in this account. SGS holdings in this account can be used for settlement.
- *Reserve account*  
To maintain SGS for compliance with MLA requirements.
- *Customer account*  
To maintain SGS that belong to a participant's customer.
- *Non-resident accounts*  
To maintain SGS that belong to a participant's non-resident customer. Different accounts may be created for non-resident customers who are subject to various levels of withholding taxes.
- *ILF account*  
To maintain SGS pledged under an intraday liquidity facility (ILF) arrangement.

#### 4.3.1.4 Operation of the system

The operation of MEPS+-SGS is the same as for MEPS+. Details can be found in Section 3.2.4.

#### 4.3.1.5 Risk management

To mitigate settlement risk, the MEPS+-SGS is linked to the MEPS+-IFT system to facilitate the settlement of SGS transactions on a DVP basis. If the seller of SGS has insufficient SGS for delivery, the transaction is queued in MEPS+-SGS until sufficient SGS are made available. Once the seller has sufficient SGS, the SGS are earmarked for transfer to the buying bank and an IFT payment message is sent to MEPS+-IFT.

If the buying bank has insufficient funds to pay for the SGS purchase, the payment is queued in MEPS+-IFT. When the funds become available, the amount is debited from the buyer's RTGS account and credited to the seller's RTGS account. The MEPS+-IFT subsystem simultaneously instructs the MEPS+-SGS subsystem to transfer the securities to the purchasing bank.

#### 4.3.1.6 Links to other systems

MEPS+-SGS is linked to MEPS+-IFT to facilitate the settlement of SGS transactions on a DVP basis. CDP participates in MEPS+-SGS to provide SGS custody service for retail investors.

#### 4.3.1.7 Use of the system by the central bank

MEPS+ provides final and irrevocable settlement of SGS transactions on both a free-of-payment (FOP) and DVP basis. The issuance of SGS within MEPS+-SGS is on a DVP basis. On the issuance date, MEPS+-SGS automatically performs issuance to the successful bidders on a DVP basis. That is, the securities are issued and transferred into the successful bidders' securities accounts only after the successful bidders' MEPS+-RTGS accounts are successfully debited.

For SGS coupon payments within MEPS+-SGS, MEPS+-SGS automatically calculates the coupon payment at the beginning of the ex-date according to the coupon rate and coupon frequency of the securities and the members' holdings. The ex-date period, coupon payment date, coupon payment rate and coupon payment frequency are specified for each SGS issue in MEPS+-SGS at the start and MEPS+-SGS will derive the rest of the coupon payment schedule accordingly.

On the coupon payment date, MEPS+-SGS automatically pays the calculated coupon amounts to the holder (as at ex-date) of the SGS by debiting the MAS' MEPS+-RTGS account and crediting the holder's MEPS+-RTGS account. For all outstanding (as at ex-date) interbank repo transactions in MEPS+-SGS, the reverse interest amounts will also be automatically debited from the original receiving member's account (ie the receiving member for the opening leg of the transaction) and credited to the original delivering member's account.

For SGS redemptions within MEPS+-SGS, MEPS+-SGS automatically calculates the redemption proceeds that are due to holders on the maturity date. The maturity date is specified for each SGS issue in MEPS+-SGS. On the maturity date, MEPS+-SGS automatically calculates the redemption proceeds according to the quantity of SGS holdings. MEPS+-SGS then pays the redemption proceeds to the existing holder of the SGS on a DVP basis by debiting the MAS' MEPS+-RTGS account and crediting the relevant member's MEPS+-RTGS account while also redeeming the SGS from the respective SGS accounts.

## **4.3.2 CDP**

### *4.3.2.1 Institutional framework*

The settlement of securities is governed by the CDP clearing rules and DVP rules. CDP as a central depository is governed under the Companies Act. CDP's depository system allows retail investors to hold direct accounts besides accounts held by depository agents (custodian banks). CDP's terms and conditions govern the depository and the depositors.

### *4.3.2.2 Participation*

The participants in the securities settlement system are clearing members and depository agents. After CCP clearing and netting have occurred, CDP effects securities settlement between clearing members for trades done on SGX-ST. For institutional trades, CDP also effects securities settlement between clearing members and institutional investors through depository agents. For retail trades, CDP effects securities settlement between clearing members and retail investors.

### *4.3.2.3 Types of transactions*

CDP settles equities, structured warrants, company warrants, corporate bonds, extended settlement contracts, REITS, ETFs, ETNs, business trusts, ADRs and GDRs that are traded on SGX-ST.

CDP also operates a securities settlement system for corporate bonds traded on the OTC market, the DCSS, a gross DVP settlement system. CDP does not act as the central counterparty for such trades.

### *4.3.2.4 Operation of the system*

Securities certificates are immobilised with CDP, which operates as a CSD. Although the deposited securities at the CDP are registered in its name, CDP acts as a bare trustee, holding the securities on behalf of investors. Investors maintain securities accounts with CDP, and their securities holdings are reflected in these accounts. Depository agents and custodian banks may also maintain sub-accounts for those investors who do not maintain a direct account with CDP (eg overseas investors).

Under the book-entry settlement system, the transfer of securities ownership is effected through computerised book entries. On T+3, for retail investor trades, the buying clearing member will pay funds to CDP, while CDP will pay funds to the selling clearing member. After payment obligations are settled, CDP will debit securities from the seller's account and credit them to the selling broker's account. Subsequently, the securities will be debited from the selling broker's account and credited to the buying broker's account before they are credited to the buyer's account. If CDP determines that the selling broker has insufficient securities on T+2, CDP will automatically buy in against the selling broker on T+3, who will also be subject to penalties. Investors then settle money payments with their brokers.

Institutional investors can opt not to settle their trades with their brokers but with CDP via DVP. Depository agents or custodian banks settling on behalf of institutional investors use the Pre-Settlement Matching Service (PSMS), an open-access infrastructure developed by SGX. PSMS automates the matching of settlement instructions between the settling parties of institutional trades. If an investor opts to settle trades under the DVP rules, a custodian bank undertakes vis-à-vis CDP that it has sufficient securities or funds to meet the transaction obligations. For matched delivery instructions, CDP is irrevocably authorised to debit the securities from the relevant sub-accounts of the custodian bank. CDP's system will

then earmark the securities to be delivered by moving them from the “free” balance to the “available” balance.<sup>21</sup>

Cash settlement is net of all the matched and validated DVP purchase and sale settlement instructions for a settlement day. The net paying settlement banks pay CDP’s clearing bank, and the clearing bank in turn pays the net receiving settlement banks on behalf of CDP with cash settlement finality at the end of T+3.

As mentioned above, CDP also operates DCSS, a securities settlement system for private bonds traded on the OTC market. OTC bond transactions can be settled on a DVP or FOP basis. Funds are transferred via MEPS+ and securities are simultaneously transferred via the DCSS book-entry system on a gross trade-for-trade basis. A real-time DVP arrangement is achieved through a live leased line link between DCSS and MEPS+. On a FOP settlement basis, the transacting parties use CDP only for securities transfer and arrange for funds transfer separately.

#### *4.3.2.5 Risk management*

In respect of trades settled on a DVP basis, CDP is exposed to the direct counterparty risk of the settlement banks settling for institutional clients. CDP’s guarantee for DVP trades is supported by a two-tier guarantee of the settlement banks and the clearing bank. The settlement bank guarantees to make payment on behalf of the custodian banks once a settlement instruction is matched and validated. If the settlement bank is unable to make payment on the due date, the clearing bank is obliged to make the required payment.

#### *4.3.2.6 Links to other systems*

International central securities depositories (ICSDs) such as Euroclear and Clearstream also participate in the Singapore securities market. Trades done outside Singapore can be settled through ICSDs. These ICSDs have indirect linkages with CDP through their depository agents, which facilitate clearing and settlement for international investors in their systems. Transactions can be settled on a DVP or FOP basis.

## **4.4 Use of securities infrastructure by the central bank**

The MAS Standing Facility was launched in 2006 to manage intraday interest rate volatility and to serve as a safety valve for the banking system. The Standing Facility allows banks to place excess funds with or borrow from MAS against SGS collateral. Such funds transfers and DVP SGS transfers are effected in MEPS+.

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<sup>21</sup> For securities in the “free” balance, the account holder has full legal title to them, while securities in the “available” balance are either securities purchased by the account holder but not yet paid for, or securities earmarked for subsequent transfers.