

**Payment systems in  
Singapore**



## Table of contents

List of abbreviations .....	319
Introduction .....	321
1. The institutional aspects .....	321
1.1 The general legal and regulatory framework .....	321
1.2 The role of the Monetary Authority of Singapore .....	322
1.2.1 Development and regulation of payment systems .....	322
1.3 The role of other private and public sector bodies .....	322
1.3.1 Singapore Clearing House Association (SCHA) .....	322
1.3.2 Association of Banks in Singapore (ABS) .....	323
1.3.3 Electronic Payments Technical Committee (EPTC) .....	323
1.3.4 Controller of Certification Authorities (CCA) .....	323
1.4 The role of financial intermediaries .....	323
1.4.1 Banks .....	323
1.4.2 Banking liberalisation programme .....	324
1.4.3 Internet-only banks (IOB) .....	325
2. Payment media used by non-banks .....	325
2.1 Cash payments .....	325
2.2 Non-cash payments .....	325
2.2.1 GIRO .....	325
2.2.2 Credit transfers .....	325
2.2.3 Direct debits .....	326
2.2.4 Cheques .....	326
2.2.5 Payment cards .....	326
2.2.6 Other access channels for banking and payments .....	327
3. Interbank exchange and settlement systems .....	328
3.1 General overview .....	328
3.2 MAS Electronic Payment System (MEPS) .....	328
3.2.1 Operating rules .....	329
3.2.2 Participants in the system .....	329
3.2.3 Types of transactions handled .....	329
3.2.4 Operation of the transfer system and the transaction processing environment ...	329
3.2.5 Settlement procedures .....	330
3.2.6 Credit and liquidity risks and their management .....	330
3.2.7 Pricing policies .....	330
3.3 Retail payment systems .....	330
3.3.1 Singapore Dollar Cheque Clearing System (SGDCCS) .....	330
3.3.2 US Dollar Cheque Clearing System (USDCCS) .....	331

3.3.3	Interbank GIRO (IBG) .....	332
3.3.4	ATM networks .....	332
3.3.5	EFTPOS .....	333
3.3.6	Main projects and policies being implemented - Cheque Truncation System .....	333
4.	Securities settlement systems .....	334
4.1	Singapore government securities .....	334
4.1.1	Trading .....	334
4.1.2	Pre-settlement .....	334
4.1.3	Settlement .....	335
4.2	Corporate and statutory board bonds.....	335
4.2.1	Trading .....	335
4.2.2	Pre-settlement .....	335
4.2.3	Settlement .....	335
4.3	Equities .....	336
4.3.1	Trading .....	336
4.3.2	Pre-settlement .....	336
4.3.3	Settlement .....	336
4.3.4	Risk management .....	337
4.4	Derivatives .....	337
4.4.1	Trading .....	337
4.4.2	Pre-settlement .....	337
4.4.3	Settlement .....	337
4.4.4	Risk management .....	338
4.5	The use of the securities infrastructure by MAS.....	338

**List of abbreviations**

ABS	Association of Banks in Singapore
BCCS	Board of Commissioners of Currency, Singapore
BCS	Banking Computer Services Pte Ltd
CCA	Controller of Certification Authorities
CDP	Central Depository (Pte) Limited
CTS	Cheque Truncation System
DCSS	Debt Securities Clearing and Settlement System
ECS	Electronic Clearing System
EPTC	Electronic Payments Technical Committee
FOP	Free of payment
IBG	Interbank GIRO
IDAS	Institutional Delivery Affirmation System
IFT	Interbank Funds Transfer
IOB	Internet-only bank
MAS	Monetary Authority of Singapore
MCB	Minimum Cash Balances
MEPS	MAS Electronic Payment System
MLA	Minimum Liquid Assets
NETS	Network for Electronic Transfers (Singapore) Pte Ltd
QFB	Qualifying full bank
QOB	Qualifying offshore bank
SACH	Singapore Automated Clearing House
SCHA	Singapore Clearing House Association
SGDCCS	Singapore Dollar Cheque Clearing System
SGS	Singapore Government Securities
SGX	Singapore Exchange
USDCCS	US Dollar Cheque Clearing System



## Introduction

A payment system comprises the cultural, political, legal, economic and business practices and arrangements used within a market economy to determine, store and exchange value or ownership of goods and services. In its simplest form, a payment stems either from a trade between buyers and sellers in a market or from a financial obligation.

Modern payment systems in a market economy can be modelled in three major segments: first, the instruments used to deliver payments; second, the clearing and settlement process involved in a payment transaction; and finally, the actual transfer of funds between institutions.

Singapore's payment system has evolved over the years, driven by technological progress, changing consumer needs and development of new financial activities. It has changed from one that was based essentially on paper and cash transactions to one today that has a diverse range of cashless payment instruments, as well as efficient and reliable clearing and settlement systems.

In Singapore, the common methods of making retail payments besides using currency comprise cheques and interbank GIRO debit and credit transfers as well as payment cards (stored value, debit and credit cards). Banks' customers can also use their debit cards to make third-party account funds transfers and to make bill payments to selected commercial and government entities via the ATMs. More recently, banks' customers have been able to make bill payments and third-party funds transfers through their telephone, mobile and internet banking services.

The Monetary Authority of Singapore (MAS) operates a real-time gross settlement system, MAS Electronic Payment System, for large-value local currency interbank fund transfers and the settlement of scripless Singapore Government Securities.

## 1. The institutional aspects

### 1.1 The general legal and regulatory framework

A number of laws and bye-laws have a bearing on payment instruments and institutions in Singapore.

Cheques and GIRO transactions cleared through the Automated Clearing House are regulated by the following laws and bye-laws:

- *Section 59 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 other credit instruments, and ensure its smooth operation.
- *Banking (Clearing House) Regulations, Cap. 19, Regulation 1*, subsidiary legislation administered by MAS, sets the framework with respect to clearing with the Automated Clearing House.
- The *Bills of Exchange Act* governs how cheques are drawn, accepted and paid.
- The *Bye-laws of the Singapore Clearing House Association (SCHA)* state the rules and regulations for participation in the clearing of cheques and GIRO.

*Section 77A of the Banking Act* states that only banks authorised by MAS can issue stored value instruments that have multiple payment capabilities.

*Section 59A of the Banking Act* makes provision for MAS to establish and operate one or more real-time gross settlement (RTGS) systems. MAS is responsible for the smooth operation of the RTGS system and ensures that participants comply with the rules and regulations.

The *Currency Act (Chapter 69)* established the Board of Commissioners of Currency, Singapore (BCCS) in 1967. The Act conferred on the BCCS the sole right to issue currency in Singapore. A notable provision of the Act is that the Singapore dollar must be 100% backed by external assets. This is achieved through the maintenance of a currency fund consisting of foreign currencies, demand and time deposits, treasury bills and securities, and gold.

With the increasing trend towards electronic transactions, digital signatures are becoming more important, both for identification purposes and to serve as an alternative to hand-written signatures. Digital signatures are also useful in preventing unauthorised alteration of the contents of electronic documents. On 10 July 1998, the *Electronic Transactions Act* was enacted to provide for the legal recognition of digital signatures and establish the framework to facilitate electronic commerce transactions in Singapore.

The Central Depository (Pte) Ltd (CDP), a wholly owned subsidiary of the Singapore Exchange (SGX), operates the securities clearing and settlement systems for securities listed or quoted on Singapore Exchange Securities Trading Ltd (SGX-ST), including equities, corporate debt securities and other instruments such as warrants and exchange traded funds.

MAS regulates CDP as a clearing house under the *Securities and Futures Act* (SFA).

MAS is the fiscal agent of the Singapore government. MAS is empowered by the *Development Loan Act* and the *Government Securities Act* to undertake the issue and management of Singapore Government Securities (SGS) on behalf of the government. MAS also operates the securities clearing and settlement systems for SGS and ensures that participants comply with the rules and practices of the SGS market.

## **1.2 The role of the Monetary Authority of Singapore**

The Monetary Authority of Singapore (MAS) was established as a statutory board under the Monetary Authority of Singapore Act in 1970. Its mission is to promote sustained non-inflationary economic growth and a sound and progressive financial services sector.

MAS acts as a settlement agent for the banking institutions in Singapore, by allowing funds transfers to take place across the banks' settlement accounts held with MAS.

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.

MAS operates the real-time gross settlement system MEPS which settles large-value interbank funds transfers (see Section 3.2). MEPS is also designed to handle the settlement of scrippless Singapore Government Securities (SGS). Payment obligations that arise from trading in SGS and other Singapore dollar-denominated corporate debt may be settled on a delivery versus payment (DVP) basis via interfaces to the interbank funds transfer system in MEPS (see Section 4.2).

### **1.2.1 Development and regulation of payment systems**

As part of its mission to promote a sound and progressive financial services sector, MAS oversees the payment system to ensure its overall safety, efficiency and development. MAS thus puts in place or facilitates relevant policies, practices and principles used throughout payment, clearing and settlement systems in Singapore.

MAS has explicit legislative powers to establish and operate RTGS systems, oversee the management of the cheque and Interbank GIRO systems and regulate the issuance of multipurpose stored value cards. These powers are spelt out under the various Acts and Regulations as highlighted in Section 1.1. In addition, MAS exercises oversight in other payment areas indirectly through banks. MAS has a good working relationship with payment system participants and stakeholders which complements its legislative role in the respective systems. MAS often relies on extensive industry consultation to ensure its objectives for the payment system are achieved.

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

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

The SCHA is an association, formed in December 1980, to establish, manage and administer clearing services and facilities for cheques and debit and credit items of its members. It comprises MAS and the commercial banks in Singapore that wish to become members. As at end-December 2000, the SCHA had 48 ordinary members and 87 associate members. The SCHA establishes the rules on the rights and responsibilities of participating banks as well as the service providers for the various



clearing systems; it is also responsible for the Singapore Automated Clearing House (SACH), which operates the Singapore Dollar Cheque Clearing System, the US Dollar Cheque Clearing System, and the Interbank GIRO System.

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

The ABS is made up of member banks drawn from a wide spectrum of banking entities licensed by MAS. It represents the interests of its members, sets minimum standards of good practice for these members and supports projects that are mutually beneficial.

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

### **1.3.3 Electronic Payments Technical Committee (EPTC)**

The EPTC is an industry-based group established by the Information Technology Standards Committee (ITSC) under the auspices of the Singapore Productivity and Standards Board and the Infocomm Development Authority of Singapore.

Its mission is to identify, review and propose standards for adoption in Singapore in the following areas:

- Electronic bill presentment and payment systems/services
- E-payment infrastructure, systems and services
- Electronic commerce
- Mobile commerce
- Public key identification/Certification authority infrastructure, interoperability and connectivity.

Member organisations participate in various projects to recommend standards. When standards are established, EPTC will also hold roadshows and workshops to promote the standards to the industry.

As at December 2000, EPTC had over 35 member organisations from the financial sector, including MAS, most major banks, credit card companies, e-commerce systems vendors and payment services firms.

### **1.3.4 Controller of Certification Authorities (CCA)**

As specified under the *Electronic Transactions Act*, the CCA oversees the activities of certification authorities (CAs), by licensing, certifying, monitoring developments and using other controls.

The licensing scheme for CAs is voluntary. It promotes high-integrity CAs that can be trusted. A licensed CA enjoys the benefits of evidentiary presumption for its digital signatures. A CA wishing to obtain a licence must meet stringent licensing criteria in various aspects, including financial soundness, personnel integrity, strict security controls and procedures. The licensing criteria are stipulated in the *Electronic Transactions Act 1998*, *Electronic Transactions (Certification Authorities) Regulations 1999* and the *Security Guidelines for Certification Authorities*.

The CCA is subsumed under the Infocomm Development Authority of Singapore.

## **1.4 The role of financial intermediaries**

### **1.4.1 Banks**

Singapore's payment landscape is predominantly the domain of banks.

Commercial banks in Singapore are allowed to engage in a wide range of financial services. These include 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-December 2000, there were 134 commercial banks in Singapore, eight of which were locally incorporated.

Commercial banks are licensed under the *Banking Act* (Chapter 19). Their activities are also governed by MAS' Notices to Banks and guidelines issued from time to time. There are three categories of commercial banks in Singapore: full banks; wholesale banks; and offshore banks.

Banks are currently the only institutions able to process across all segments of the payment process chain (acquisition, processing, clearing and settlement). However, new payment service providers are expected to play a greater role in the coming years.

#### 1.4.1.1 Full banks

Full banks are authorised to transact the whole range of banking business, both personal and corporate. These include the operation of current, savings and fixed deposit accounts, financing of exports and imports, transfer of funds, commercial letters of credit, trust receipts, traveller's cheques and currencies. Full-licensed banks may also provide advice on trade and investment and foreign exchange regulations, and may furnish credit reports and trade information.

Most full-licensed banks provide the full range of retail payment services such as cheque services, funds transfers, issuance of credit and debit cards, and ATM services. As at end-December 2000, there were 31 full-licensed banks, eight of which were locally incorporated banks and the remainder branches of foreign banks. Foreign full banks face some restrictions on the setting-up of branches and offsite ATMs. Currently only local banks can provide EFTPOS services.

#### 1.4.1.2 Wholesale banks

Formerly known as restricted banks, wholesale banks may engage in the whole range of banking activities afforded to a full-licensed bank except that they may not:

- (1) accept Singapore dollar fixed deposits of less than SGD 250,000 per deposit from non-bank customers;
- (2) pay interest on Singapore dollar current accounts operated by resident individuals.

As at end-December 2000, there were 20 wholesale banks in Singapore, all of which were branches of foreign banks.

#### 1.4.1.3 Offshore banks

The category of offshore banks was introduced in 1973 with the aim of improving the scope of activity in the Asian dollar market. Offshore banks enjoy similar opportunities to full and wholesale banks for business in the offshore market, but their scope of business in the Singapore dollar retail market is limited.

In addition to the conditions imposed on wholesale banks, offshore banks also cannot:

- (1) accept interest-bearing Singapore dollar deposits from resident non-bank customers other than approved financial institutions;
- (2) extend total credit facilities in Singapore dollars exceeding SGD 500 million to non-bank customers who are residents of Singapore. Qualifying offshore banks can offer credit facilities of up to SGD 1 billion.

As at end-December 2000, there were 83 offshore banks in Singapore, all of which were branches of foreign banks.

### 1.4.2 Banking liberalisation programme

In May 1999, MAS announced a five-year programme to liberalise commercial banking in Singapore. This was aimed at promoting a more open and competitive environment and to spur the development and upgrading of local banks.

MAS granted qualifying full bank (QFB) privileges to four foreign banks, wholesale banking licences to eight offshore banks and qualifying offshore bank (QOB) status to eight offshore banks. In addition to the normal privileges accorded to a foreign full bank, the QFB privileges allow the banks, inter alia, additional branches and ATMs.

In June 2001, MAS further announced that it had awarded another two banks QFB status and grant all QFBs enhanced privileges in branching and establishing offsite ATMs.<sup>1</sup> In addition, from 1 July 2002, QFBs are allowed to provide debit services on an EFTPOS services. Restricted and offshore banking licences (including QOB) will be consolidated into a new wholesale banking licence. Wholesale banks will be able to engage in all activities of the restricted banks. For a start, all current restricted banks are renamed wholesale banks and MAS will issue a further 20 wholesale banking licences within the next two years, with priority accorded to existing QOBs.

*(More information on the banking liberalisation programme, including how new licences are granted, can be found on the MAS website at [www.mas.gov.sg](http://www.mas.gov.sg).)*

### **1.4.3 Internet-only banks (IOB)**

MAS issued a policy statement on internet banking in July 2000. MAS is prepared to grant new banking licences for Singapore-incorporated banking groups to set up separate banking subsidiaries (including joint venture entities) to pursue new business models, including internet-only banking, outside their existing banking entities. There is currently one bank operating under the IOB business model.

## **2. Payment media used by non-banks**

### **2.1 Cash payments**

As in most countries, currency remains the most accepted payment medium for small-value transactions in Singapore.

The BCCS has the sole right to issue currency and coins. Notes are in circulation in denominations of SGD 1, 2, 5, 10, 20, 50, 100, 500, 1,000, 5,000 and 10,000. Coins are issued in denominations of SGD 0.05, 0.10, 0.20, 0.50 and 1.00. SGD 0.01 coins ceased to be issued in 2002, although they remain legal tender.

Singapore dollars in circulation are fully backed by a basket of external assets that includes gold and other foreign currencies.

### **2.2 Non-cash payments**

#### **2.2.1 GIRO**

The Interbank GIRO (IBG) system is an offline interbank payment system catering mainly for low-value bulk payments. IBG allows a customer of a participating bank to transfer funds, through direct debits or credits, to or from the accounts of customers of any other participating bank. The IBG can be broadly separated into two classes according to the type of transfers: direct debit transfers and direct credit transfers.

#### **2.2.2 Credit transfers**

In credit transfers, the payer instructs his bank to debit his account and transfer the funds to the payee. In Singapore, most credit transfers are standing order arrangements made by the originators with their bank. The bank then carries out the necessary transfers on a regular specific date, to a specific receiver and for a specific amount. Payroll crediting is the most common direct credit transfer.

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<sup>1</sup> With the second phase of banking liberalisation, each QFB is permitted to establish up to 15 locations, of which up to 10 can be branches. The 15 locations can include both branches and off-site ATMs. The sub-limit of 10 branches can include branches and limited-purpose branches.

Some banks have recently offered direct crediting services to their individual customers, mainly through internet banking and ATMs. These individual instructions are processed together with the bulk credit instructions for that day.

The number of IBG transactions processed in 2000 was 30 million, for a value of SGD 72 billion.

### **2.2.3 Direct debits**

In debit transfers, the payee instructs his bank to collect payment from the paying party, often on a recurring basis. Direct debit payments are preauthorised by the paying customer, who gives permission to his bank to debit his account upon receipt of instructions initiated by the specified originator. Examples of such preauthorised recurring payments include utility bill payments or payments for telecommunications services.

### **2.2.4 Cheques**

Cheques are commonly used in Singapore by consumers for bills and small-value payments and among businesses for regular payments such as purchases of goods and services.

The number of cheques cleared by the SACH increased by more than 70% from 1989 to 1999. This can be attributed to the increased economic activity in Singapore in that period.

In 2000, 91 million cheques for a total value of SGD 453 billion were processed by the SACH.

### **2.2.5 Payment cards**

#### **2.2.5.1 Debit cards**

Debit cards can be broadly categorised into two groups: PIN-based debit cards and signature-based debit cards.

PIN-based debit cards allow cardholders to make payments or withdraw cash from their deposit accounts at ATMs and EFTPOS terminals (see Sections 2.2.5.4 and 2.2.5.5). The payment or cash withdrawal is effected through an online transfer of funds from the cardholder's account.

Visa Electron card and the Debit MasterCard are examples of signature-based debit cards in Singapore.

#### **2.2.5.2 Credit cards**

All major credit cards are offered in Singapore. The issuance of credit cards is subject to MAS guidelines and regulations, for example on eligibility criteria for card applicants and the marketing of credit cards.

Total credit card transactions amounted to SGD 10.5 billion in 2000.

#### **2.2.5.3 Electronic money**

Electronic money (more commonly known as "stored value cards" in the local context) in Singapore can be categorised into single purpose stored value cards (SPSVCs) and multipurpose stored value cards (MPSVCs). SPSVCs can only be used to pay for goods and services offered by the issuer (eg prepaid phone cards). In contrast, a MPSVC also allows cardholders to pay for goods and services offered by other merchants or organisations.

CashCard, launched in November 1996, is a MPSVC jointly issued by the three local banks.<sup>2</sup> It offers consumers a cashless payment option at a variety of retail outlets, car parks and vending machines, as well as payment of toll charges at Electronic Road Pricing 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 reused by topping up its value to a maximum of SGD 500 at ATMs,

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<sup>2</sup> Development Bank of Singapore, Oversea-Chinese Banking Corporation and United Overseas Bank.

selected EFTPOS terminals and automated kiosks<sup>3</sup> provided by NETS as well as some mobile phones and over the internet.

Over the years, CashCard has gained increasing acceptance in Singapore. In 2000, the number of CashCard transactions was 100 million for a total value of SGD 174 million.

With the incorporation of Visa's stored value mark, Visa Cash, and the adoption of the open Common Electronic Purse Specifications (CEPS), CashCard holders will also be able to transact overseas in the near future.

#### *2.2.5.4 Automated teller machines (ATMs)*

ATMs are one of the channels that allow banks' customers to perform routine banking transactions without having to visit a bank branch. The first ATM in Singapore was installed in 1979 by Chartered Bank. Since then, many banks have followed suit, installing their own models of ATMs.

Since their introduction, ATMs have played a major role in promoting a cashless society and in bringing greater convenience to customers. ATMs offer consumers greater ease in making deposits to and withdrawals from their bank accounts. In addition, they provide other services such as shares applications, third-party funds transfers and bill payments.

As at December 2000, there were 1,787 ATMs in Singapore, representing a penetration rate of about 445 ATMs per million inhabitants.

#### *2.2.5.5 Electronic funds transfer at point of sale (EFTPOS)*

The development of Singapore as a cashless society was boosted by the introduction of the EFTPOS service by NETS in 1986. EFTPOS is a debit card system allowing ATM cardholders to use their ATM cards to pay merchants for the purchase of goods and services through an online transfer of funds from their accounts.

As at December 2000, 20,000 EFTPOS terminals were available island-wide at over 12,000 retail outlets including major supermarkets, department stores, petrol stations, government departments and a large number of smaller merchants. In 2000, there were 77 million transactions worth SGD 4.8 billion.

The CashBack service was introduced in March 2001 to allow consumers to withdraw cash at selected retail stores through EFTPOS terminals. This service is currently provided free to the ATM cardholders of the three local banks.

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

#### *2.2.6.1 Telephone banking*

Since the introduction of phone banking in 1982, the range of phone banking services offered has increased. Besides being able to transfer funds and conduct account balance enquiries over the telephone, bank customers can also make bill payments, trade in stocks and bid for Certificates of Entitlement (COEs).<sup>4</sup>

#### *2.2.6.2 Mobile banking*

More recently, bank customers have been able to conduct banking transactions through the display screen features of mobile phones. In addition, they can also pay for some online purchases using their mobile phone instead of providing their credit card details over the internet. One payment method involves payers registering their credit card account details with their mobile payment service provider. Payers can then make payments using an ID and PIN as authentication and the payment is processed as a traditional credit card transaction. Another method allows the mobile payment to be reflected as another item in the payer's phone bill.

<sup>3</sup> These automated kiosks include CashCard Automated Machines, NETS Kiosks and CashCard Service Terminals.

<sup>4</sup> To own a motor vehicle in Singapore, a COE is required. COEs are awarded based on monthly bidding.

### 2.2.6.3 Internet banking

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

A number of banks have also launched internet payment services that enable consumers to pay for their internet purchases by directly debiting their bank accounts.

## 3. Interbank exchange and settlement systems

### 3.1 General overview

The major payment and clearing functions in Singapore are provided by three main organisations.

- (1) MAS operates the settlement system for large-value interbank fund transfers, ie the MAS Electronic Payment System (MEPS).
- (2) The Singapore Clearing House Association (SCHA) provides three payment clearing and settlement systems for its member banks:
  - Singapore Dollar Cheque Clearing System;
  - US Dollar Cheque Clearing System; and
  - Interbank GIRO System.
- (3) NETS manages the clearing process for the local retail payment systems such as the local banks' ATM networks, EFTPOS and CashCard networks.

Large-value electronic payments are settled within MEPS. Payment obligations that arise from trading in Singapore Government Securities 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).

The clearing systems provided by SCHA are operated by the SACH. Obligations arising out of the Singapore Dollar Cheque Clearing System and the Interbank GIRO System are settled across banks' current accounts held at MAS. There is a direct interface between the SACH and MEPS to facilitate daily multilateral net settlement of these payment obligations on a deferred same day basis.

Obligations arising out of the US Dollar Cheque Clearing System are settled across participants' accounts held with Citibank NA, the settlement agent. At a stipulated time each working day, the settlement obligations for each participant are sent to Citibank NA.

Obligations arising out of the systems managed by NETS are settled across participants' accounts held with Development Bank of Singapore Ltd (DBS), the settlement bank. NETS advises the multilateral net obligations to DBS for settlement on a deferred basis; for ATM and EFTPOS transactions this will be on a same day basis, but for CashCard transactions settlement may occur the next day.

### 3.2 MAS Electronic Payment System (MEPS)

MAS Electronic Payment System (MEPS) is a real-time gross settlement (RTGS) system developed for large-value Singapore dollar interbank funds transfers and the settlement of scrippless Singapore Government Securities (SGS). The main 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.

Banks' current accounts held with MAS are structured to facilitate RTGS payments. Within each current account, there are two sub-accounts: the reserve account and the RTGS account. The banks' intraday Minimum Cash Balances (MCB)<sup>5</sup> requirement, if any, is maintained in the reserve account. Funds exceeding the intraday MCB requirement in the reserve account are transferred at the start of the day to the RTGS account, where they may be used for the settlement of MEPS payments. On an intraday basis, banks may also draw down the full MCB amount in their reserve account to make payments.

### **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 as stipulated by MAS.

### **3.2.2 Participants in the system**

All banks in Singapore are eligible to participate directly in MEPS. However, banks with a small volume of SGD payments may choose not to participate in the system. Instead, such non-participating banks may appoint participating banks as their agents to make SGD interbank payments on their behalf by entering into private agency agreements with any of the participating banks. The terms of such agreements are negotiated bilaterally between the banks, and are outside the ambit of MEPS. MAS, however, provides some services for these non-participating banks to transfer funds and SGS out from their MAS current accounts and SGS-Minimum Liquid Assets<sup>6</sup> (MLA) accounts respectively.

There were 90 participating banks in MEPS as at December 2000. The daily turnover value for MEPS averages around SGD 35 billion and the average daily volume of transactions is around 7,000.

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

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

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

Each participating bank has a front-end system linked to the central host computer at MAS. The front-end system allows a bank to perform data entry, submit payment instructions and make online account enquiries. Submitted payment instructions that are not able to settle due to insufficient funds in a bank'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 (FIFO) basis. The queuing mechanism has the following levels of priority:

<i>Level</i>	<i>Type of transactions</i>
1	Transactions with MAS
2	Cheque/Interbank GIRO (IBG) transactions
3	Banks' urgent transactions
4	SGS transactions

<sup>5</sup> Under Section 40 of the Banking Act, all banks in Singapore are required to maintain 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 balance on any day should not drop below 2% of the liabilities base and any balance in excess of 4% will not be counted towards the fortnightly average. The average closing MCB balance held over the fortnightly maintenance period must be at least 3% of the liabilities base.

<sup>6</sup> Under Chapter 19 of the Banking Act, as part of the MLA requirements, all banks in Singapore must hold Singapore Government Securities 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.

- 5 Banks' normal transactions
- 9 Banks' transactions on hold

Participants are only able to reprioritise payments at priority levels 3, 5 or 9. By moving these payments from one of these priority levels to another, banks can effectively determine the settlement sequence of their payments. To illustrate, a bank may not have sufficient balance to settle a priority 3 payment, but has enough to settle its other priority 5 payments. In this case, all priority 5 payments will not settle until the priority 3 payment is settled. Alternatively, the bank may place the priority 3 payment on hold with a priority 9, and then its priority 5 payments can be settled first.

The operating hours of the MEPS-IFT subsystem are 09:00 to 18:30 on Mondays to Fridays, and 09:00 to 14:45 on Saturdays.

### **3.2.5 Settlement procedures**

MEPS consists of two subsystems, namely MEPS Interbank Funds Transfer (MEPS-IFT) and MEPS Singapore Government Securities (MEPS-SGS). MEPS-SGS is described in more detail in Section 4.1.3.

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

MEP-IFT processes only same day value transactions. However, the system also accepts forward-dated transactions up to two working days forward. Such forward-dated transactions are stored in the host database and processed on the actual value date.

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

To minimise settlement risk, MAS allows banks to use the full amount of their reserves on an intraday basis. MAS may, where necessary, extend intraday credit through primary dealer banks to resolve systemic payments gridlocks. Intraday credit from MAS must be collateralised with SGS, and is extended at MAS' sole discretion. When deciding whether to extend intraday credit, MAS takes into consideration various factors, including possible systemic impact on the orderly functioning of the money market and RTGS system.

An end-of-day facility is also provided to allow banks to borrow SGD funds from MAS via overnight repurchase transactions (repos) of SGS. The interest rate charged on the overnight repurchase transaction is 2% above the reference rate. The reference rate is the one-month SGD Sibor fixed by the Association of Banks in Singapore (ABS) at 11:00 Singapore time on the same working day.

To mitigate operational risks, MEPS deploys stringent front-end application user security mechanisms, digital signatures and encryption technologies to ensure the integrity, confidentiality and authenticity of the payment messages. Business continuity and disaster recovery plans are established and regularly tested for the MEPS host system as well as the participants' front-end systems. In addition, the MEPS host and participants' front-end systems are subject to periodic operational and technical audits by MAS' Internal Audit Department (IAD) and MAS' bank examiners respectively.

### **3.2.7 Pricing policies**

Participating banks are charged on a cost recovery basis. A flat fee is charged for each MEPS message, payable by the bank initiating the message. There is no annual subscription fee or joining fee to participate in MEPS, and no additional charge for real-time current account balance enquiries.

## **3.3 Retail payment systems**

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

The operator of the SGDCCS is Banking Computer Services Pte Ltd (BCS). Direct participation in the SGDCCS is available only to ordinary SCHA members. Other SCHA members can participate



indirectly in the SGDCCS using another participating bank as an agent bank. As at December 2000, there were 41 direct participants and 71 indirect participants in the SGDCCS.

The SGDCCS is a national cheque clearing system. It was automated in 1982 with magnetic ink character recognition (MICR) technology. In 1992, it was further enhanced with the establishment of the Electronic Clearing System (ECS). ECS facilitates the electronic transfer of cheque MICR data from banks to the SACH for processing.

The clearing system was further improved in 1997 when BCS launched the image clearing system. This system allows the image of the inward cheques to be captured on a CD-ROM and sent to the paying banks for verification. This process improves the efficiency of the inward cheque clearing operation. It currently takes one working day for a Singapore dollar cheque to be cleared and funds to be released to the payee.

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

- (1) The payer sends a cheque to the payee.
- (2) The payee deposits the cheque at the presenting bank, which credits the payee's account provisionally ("on hold" cheques).
- (3) The presenting bank sends MICR information (ECS data) of cheques to the SACH. For banks sending ECS data, the corresponding physical cheques can be sent to the SACH later in the day.
- (4) After clearing the cheques and determining the net settlement amount for each participating bank, the SACH sends the net clearing figures to MEPS for broadcast and settlement.
- (5) The SACH processes and sorts the ECS data and physical cheques and these are available for collection by the relevant paying banks that evening.
- (6) If the paying bank rejects a cheque, it will return the unpaid cheques to the presenting bank through the SACH by 12:00 the next day.
- (7) The SACH will process the returned cheques and forward them to the respective presenting banks. The settlement amount for both paying and presenting banks will be 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 will transmit the multilateral net positions of all direct and indirect participants to MEPS twice a day on weekdays and once on Saturdays. The cut-off time for transmission of ECS data to the SACH for midday clearing is 14:30 on weekdays (there is no midday clearing on Saturdays). Midday multilateral net settlement positions are broadcast across MEPS at 15:05 and banks have until 15:45 to fund any net debit positions, whereupon final settlement is effected. For end-of-day cheque clearing, there are two cut-off times for transmission of data to the SACH: one for non-ECS physical cheques at 16:00 and one for ECS data at 16:45 on weekdays (12:30 and 13:15, respectively, on Saturdays). End-of-day multilateral net settlement positions are broadcast across MEPS at 17:45 (14:05 on Saturdays) and banks have until 18:15 (14:30 on Saturdays) to fund any net debit positions, whereupon final settlement is effected.

A deposited cheque will accrue interest from the day it is deposited. However, cheques are not considered paid until the paying bank has had time to validate the cheque and the drawer's capacity to cover it. Paying banks will only notify presenting banks on an exception basis, ie only if the cheque has been dishonoured (see *points 6 and 7 above*). Generally, "cleared funds" are released at 14:00 the next business day.

### **3.3.2 US Dollar Cheque Clearing System (USDCCS)**

The USDCCS was launched in 1996 to clear and settle US dollar-denominated cheques drawn on banks in Singapore. The system significantly reduced the time needed to clear a USD cheque from the previous two to four weeks to only three days. BCS and Citibank NA are the appointed clearing operator and settlement bank, respectively, for the USDCCS.

For the settlement of USD cheques, participating banks must maintain USD accounts with Citibank NA with minimum balances of USD 10,000.

The clearing and settlement process for USD cheques is as follows:

- (1) USD cheques are delivered to the SACH by presenting banks.
- (2) At the end of the first day, the SACH will generate a settlement statement to the settlement bank setting out the total credits and total debits of each of the participating banks.
- (3) The settlement bank then advises participating banks if there will be insufficient funds in their accounts with the settlement bank, based on a comparison of the total debit position against available funds in each participating bank's account. Participating banks are required to meet any projected shortfall.
- (4) The SACH processes and sorts the USD cheques and these are available for collection by the relevant paying banks on the second business day. Settlement occurs on the second business day across participating banks' accounts with Citibank NA, but the funds are not considered "cleared funds" until the end of day three.
- (5) All returned unpaid USD cheques are delivered to the SACH at the latest by the morning of the third business day.
- (6) The SACH processes the returned cheques and the relevant presenting banks collect them by noon on the third business day.
- (7) The customers can withdraw the proceeds after 14:00 on the third business day.

### **3.3.3 Interbank GIRO (IBG)**

IBG is a paperless system that allows a customer of a participating bank to transfer funds, through direct debits and credits, to the accounts of customers of any participating bank. In July 2001, the SACH introduced the eGIRO system, which removes the manual delivery of magnetic tapes between the banks and the SACH by using secured electronic transmission of payment data. Under eGIRO, the entire process of clearing and settlement, including processing of returned and rejected items, can be straight through and automated.

The clearing and settlement process for IBG is as follows:

- (1) The first party sends the payment instructions to the originating bank.
- (2) The originating bank checks the credit limit of the first party (if it is a direct credit instruction) and sends the payment instructions to the SACH for clearing.
- (3) After determining the net settlement amount for each participating bank, the SACH sends the net clearing figures to MEPS for broadcast and settlement.
- (4) The SACH forwards the payment instructions to receiving banks for the credit/debit of the second party's account.
- (5) If the payment instruction is rejected, receiving banks will return the rejected instruction to the originating bank through the SACH the next day. The SACH will adjust the settlement amount for both banks before forwarding the rejected instruction to the originating bank.
- (6) If the collection (payment) is successful, a credit (debit) statement is generated for the first party and a debit (credit) statement for the second party.

There is one clearing and settlement session for IBG payment instructions on weekdays and one on Saturdays. Participants are required to send payment instructions to the SACH by 12 noon on weekdays and 09:00 on Saturdays. The SACH will send multilateral net settlement positions to MEPS for broadcast to all banks by 15:30 on weekdays and 12:15 on Saturdays; broadcasts at these times are for information only. The figures are broadcast again at 17:45 (14:05 on Saturdays) and banks have until 18:15 (14:30 on Saturdays) to fund any net debit positions, whereupon final settlement is effected.

### **3.3.4 ATM networks**

Most banks in Singapore have proprietary ATM networks, but there are linkages between these networks providing consumers with wider access. There are currently two 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-based network; and
- The ATMNETS network, a shared ATM service of the other two local banks (United Overseas Bank and Oversea-Chinese Banking Corporation).

For transactions using the ATMNETS 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 authentication of 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 do not require any switching, as the issuing bank is able to approve them directly.

ATMNETS transactions are cleared by NETS. NETS calculates the multilateral net settlement positions for each member bank. The net amount is then provided to DBS for direct debiting/crediting of the member banks' accounts with DBS. Member banks then manage their nostro accounts at DBS through MEPS.

Cirrus and Plus transactions are cleared by Mastercard and Visa respectively on a similar principle to NETS. When currency conversions are necessary, the London interbank rate is used. Settlement for these transactions is conducted through the respective card schemes' settlement banks.

### **3.3.5 EFTPOS**

NETS' EFTPOS service was publicly launched in 1986. Currently, NETS owns more than 20,000 EFTPOS terminals, with approximately 9,200 merchants in over 12,000 outlets.

EFTPOS transactions acquired on NETS terminals are routed to NETS for processing. The routing arrangements vary depending on the card type used in the transaction:

- For debit cards issued in Singapore, NETS dispatches the transaction for authorisation to the issuing bank. The issuing bank verifies the PIN, checks that sufficient funds are available, verifies that the transaction is not fraudulent, debits the cardholder's account and informs the merchant of the successful transaction, who in turn delivers the goods/services to the cardholder.

Debit card point of sale transactions are settled across accounts held with NETS' settlement bank, DBS. NETS clears local debit card and stored value card transactions and settlement occurs via debiting/crediting of the banks' accounts with DBS:

- NETS first performs multilateral netting to determine a net settlement amount for each member bank.
  - The net amount is then submitted to DBS for debiting/crediting of the member banks' accounts.
  - Member banks then manage their nostro accounts at DBS through MEPS.
- For Maestro cards and Amex and Diners charge cards, NETS routes the transaction to the respective card processor. The card processor, on behalf of the issuing bank, checks the payment limit, verifies that the transaction is not fraudulent and authorises the merchant to deliver the goods/services. Settlement for these transactions is conducted through the respective card schemes' settlement banks.

### **3.3.6 Main projects and policies being implemented - Cheque Truncation System**

The Singapore Clearing House Association and the Association of Banks in Singapore are jointly developing a Cheque Truncation System (CTS) targeted for implementation in February 2003. The CTS is a cheque clearing system where electronic images of the cheques are captured at the point of deposit and transmitted throughout the entire clearing process. Physical movement of paper cheques will be reduced, resulting in a more efficient cheque clearing cycle.

## 4. Securities settlement systems

The securities market of Singapore comprises Singapore Government Securities (SGS), corporate debt securities, equities and derivatives products.

The two main providers of securities settlement systems in Singapore are MAS and the Central Depository (Pte) Ltd (CDP).

- (1) The MEPS-SGS subsystem at MAS clears and settles SGS trades on a DVP basis.
- (2) The CDP is the clearing house for Singapore equities, corporate debt securities and derivatives products and has the following systems for clearing and settlement:
  - Institutional Delivery Affirmation System (IDAS), which is used for custody and settlement of equities traded by institutional clients;
  - Debt Securities Clearing and Settlement System (DCSS), an electronic book-entry system for the custody and settlement of Singapore dollar statutory board and corporate debt securities; and
  - Clearing Operations and Risk Evaluation system (CORE), the clearing system for all derivatives contracts.

### 4.1 Singapore government securities

MAS acts as the agent for the Government of Singapore in issuing Singapore Government Securities (SGS), comprising treasury bills (T-bills) and government bonds. Maturities range from three months to 15 years with three-month and one-year benchmarks for T-bills and two-, five-, seven-, 10- and 15-year benchmarks for bonds. Since May 2000, MAS' issuance programme has aimed to build large and liquid benchmark bonds. This has been achieved through larger issuance of new SGS bonds and reopenings of existing issues, thereby enlarging the free float of SGS available for trading.

#### 4.1.1 Trading

MAS issues T-bills and bonds on a regular basis. Three-month T-bills are issued weekly, whilst one-year T-bills and two-, five-, seven-, 10- and 15-year bonds are issued according to an annual issuance calendar, which is usually announced in September for the following year. The exact size of each T-bill and bond auction is typically announced a week ahead of the scheduled auction date. Auction announcements are made via MAS' website and major local newspapers. SGS are not listed on the Singapore Exchange and trading of SGS is done on an over-the-counter (OTC) basis.

SGS primary dealers play a critical role in the growth and development of the bond market by carrying out the following functions:

- (i) Providing liquidity to the SGS market by quoting two-way prices under all market conditions;
- (ii) Underwriting issuance at SGS auctions;
- (iii) Providing market feedback to MAS; and
- (iv) Assisting in the development of the SGS market.

There are 18 approved secondary dealers among banks, merchant banks and stockbroking firms. In addition, another 98 banks maintain book-entry SGS accounts with MAS for their own trading. Apart from the dealers and brokers, other market participants include finance companies, insurance companies, fund managers, corporations and individuals.

#### 4.1.2 Pre-settlement

Trade confirmation is performed using the MEPS-SGS system. The bond seller keys in the agreed trade details into MEPS-SGS. The bond buyer confirms the same trade in the system. After confirmation, trades move into the settlement phase.

### 4.1.3 Settlement

The MEPS-SGS system holds government bonds and facilitates the instantaneous and irrevocable transfer of SGS and is linked to the MEPS system to provide DVP for SGS transactions. Under the scripless settlement system, crediting or debiting the securities owner's account through computerised book entries will effect any transfer of securities. The users of the system can choose either DVP-based or FOP-based settlement in the MEPS-SGS system. DVP settlement of SGS transactions occurs on an electronic basis over MEPS and MAS-SGS book-entry clearing system. FOP settlement involves a transfer of SGS without a corresponding funds transfer instruction.

The MEPS-SGS system opens at 09:00 daily to process SGS transactions with payments. Participating banks of MEPS need to maintain two accounts in the MEPS-SGS subsystem:

- *SGS-MLA account*  
To maintain SGS for compliance with the MLA requirements.<sup>7</sup>
- *SGS-Free account*  
SGS holdings in excess of the minimum MLA requirements are maintained in the SGS-Free account. SGS holdings in this account can be used for settlement.

Banks can only sell SGS in the SGS-Free account. Transfers of SGS from the SGS-MLA account to SGS-Free account can only be effected if the value of the remaining SGS in the SGS-MLA account is equal to or exceeds the prudential requirement of 10% of liabilities. If this prudential requirement is not met, the transfer is rejected by the system.

If the seller of SGS has insufficient SGS for delivery, the transaction is queued in MEPS until sufficient SGS are made available in the seller's SGS-Free account. When the seller's SGS-Free account has sufficient SGS, the SGS are earmarked for transfer to the buying bank and an IFT payment message is sent to MEPS.

If the buying bank has insufficient funds to pay for the SGS purchase, the payment is queued in MEPS. 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 will simultaneously notify the MEPS-SGS subsystem to transfer the securities to the purchasing bank. The settlement date convention for SGS transactions is T+1.

## 4.2 Corporate and statutory board bonds

### 4.2.1 Trading

There have been several landmark bond issues by supnationals and foreign corporates, as well as public sector statutory boards. In 2001, total Singapore dollar and non-Singapore dollar-denominated debt issuance was SGD 21.9 billion and SGD 58.7 billion, respectively. Trading of corporate and statutory bonds is done on an OTC basis.

### 4.2.2 Pre-settlement

Both the securities buyer and seller input settlement instructions, containing key details of the trade, into the Debt Securities Clearing and Settlement System (DCSS). Upon matching of the settlement instructions, the seller's debt securities are earmarked and the transaction proceeds on to settlement. Matched instructions can only be revoked by the buyer.

### 4.2.3 Settlement

DCSS commenced operations in 1998 and is an electronic book-entry system for the custody and settlement of Singapore dollar bonds, replacing the need for physical delivery of bond certificates. Bond transactions can be settled on a DVP or FOP basis. All exchange-listed corporate debt securities

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<sup>7</sup> Please refer to footnote 6.

transactions are settled on a DVP basis. Cash settlements for trades occur in MEPS. Funds are transferred via MEPS-IFT while 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 linkage between DCSS and MEPS. On a FOP settlement basis, the transacting parties use CDP only for securities transfer and arrange for funds transfer separately.

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

## **4.3 Equities**

### **4.3.1 Trading**

The Singapore Exchange (SGX), via its subsidiary Singapore Exchange Securities Trading Limited (SGX-ST), provides an electronic platform for the trading of equities. SGX-ST provides a market in a wide range of domestic and foreign securities that are traded on a scripless basis. As at end-March 2001, SGX-ST had 35 member companies and 47 non-member companies. Members and non-member companies are licensed as dealers by MAS under the *Securities Industry Act*. As at end-June 2001, there were 491 companies listed on SGX, with market capitalisation of SGD 361 billion.

All securities certificates are deposited with CDP, a subsidiary of SGX. Under the scripless settlement system, crediting or debiting the owner's account through computerised book entries will effect any transfer of securities. CDP operates as a central nominee and all deposited securities at the CDP are registered in its name. CDP holds the securities on the owner's behalf but it does not have any rights over them.

In December 2001, SGX and the Australian Stock Exchange (ASX) established an active electronic link between the two exchanges' trading and settlement systems. The link allows investors in Singapore and Australia to co-trade selected securities in each other's market directly, through brokers in their own countries, whenever the respective markets are open.

### **4.3.2 Pre-settlement**

The clearing process begins with trade matching, which occurs immediately upon execution of the trade in the Singapore Exchange Securities Order Processing System (SESOPS), a fully automated trading platform. Once the trade is matched, CDP, through novation, becomes a counterparty to each side of the transaction, thus guaranteeing performance to the brokers on each side of the trade.

### **4.3.3 Settlement**

Participants in the clearing and settlement framework

- *SGX member companies*  
SGX member companies' participation in the system is compulsory.
- *Clearing members*  
Only SGX member companies are clearing members of CDP.
- *Principals*  
Principals are custodian banks approved by CDP to settle trades on a DVP basis for their clients. Participation is optional and is by application to CDP.
- *Settlement banks*  
Settlement banks are selected by CDP to facilitate the funds settlement between CDP and the principals.
- *Clearing bank*  
The clearing bank is appointed by CDP to settle funds transfer between principals' settlement banks and CDP.

- *International clearing agents*  
International clearing agents such as Euroclear and Clearstream participate through their depository agents in Singapore.

The Institutional Delivery Affirmation System (IDAS) commenced operations in 1997 and is used to settle trades on a DVP basis. Trade settlement consists of two processes: trade affirmation followed by cash settlement. CDP acts as the central counterparty to each affirmed trade and ensures the delivery of securities against payment. Under the IDAS DVP rules, custodian banks must ensure that there are shares to meet delivery obligations before affirming the sale transaction. CDP is irrevocably authorised to debit the securities from the relevant sub-accounts of the custodian bank. The system earmarks the securities to be delivered by moving them from the “free” balance to the “available” balance. Securities in the “free” balance can be traded by the account holder, but securities in the “available” balance cannot be used by the account holder for any transaction.

Cash settlement in IDAS is on a net basis of all the affirmed purchase and sale transactions for a settlement day. The net paying settlement banks pay to the 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. Securities are debited from the “available” balance of the seller and credited to the “free” balance of the buyer on T+3 as well.

#### **4.3.4 Risk management**

All equities settlements in IDAS are performed on a DVP basis. CDP’s guarantee for DVP trades is supported by undertakings and bank guarantees by the various settlement agents. A settlement agent has to make payment on behalf of its clients once a trade is affirmed. If the settlement agent is unable to make payment on the due date, its settlement bank is obliged to make payment on its behalf. In the event that the settlement bank is unable to make payment to CDP, the clearing bank is obliged to make the required payment.

CDP has a Clearing Fund that is applied in the event a clearing member is unable to discharge its financial obligations to CDP or if CDP suffers any loss as a result of liquidating a clearing member’s position. In addition, SGX maintains a Fidelity Fund to compensate any person who suffers pecuniary loss through the defalcation of a securities market member or any of its directors or employees.

## **4.4 Derivatives**

### **4.4.1 Trading**

The trading of derivatives products is carried out on the Singapore Exchange through its subsidiary, Singapore Exchange Derivatives Trading Limited (SGX-DT). SGX-DT provides investors in Singapore with risk management and trading facilities, offering futures and options contracts covering interest rates, currencies, stock indices and energy. Trading is mostly done on the exchange’s Electronic Trading System (SGX ETS). All SGX-DT members may gain direct access to SGX ETS. Corporate non-clearing members, commercial associate members and individual non-clearing members must apply through clearing members. Institutions which are not members of SGX-DT may apply for direct access through an SGX-DT clearing member.

### **4.4.2 Pre-settlement**

SGX Derivatives Clearing (SGX-DC), a subsidiary of SGX, is responsible for clearing of derivatives products. SGX-DC assumes the role of counterparty to all executed trades. Novation occurs as soon as a trade is matched in the SGX ETS system and transmitted to SGX-DC. As a consequence, all financial obligations arising from the transaction are guaranteed by SGX-DC.

### **4.4.3 Settlement**

SGX-DC revalues all positions carried on clearing members’ books on a daily basis by margining and marking to the latest market prices. SGX-DC computes daily the amount which each clearing member had made or lost on trades executed that day and on open positions brought forward using the settlement price. Every clearing member’s margin requirements are subsequently recomputed.

At the end of each clearing cycle, credit/debit instructions are sent to SGX-DC's settlement banks to instruct them to credit/debit clearing members' accounts for mark to market profits/losses and margin calls. Upon receiving these settlement instructions, each settlement bank is required to confirm to SGX-DC within a stipulated time via SWIFT that they are able to carry out the instructions. Rules of the Exchange will be used to handle a situation where a settlement bank cannot provide confirmation to SGX-DC for any clearing member by the deadline.

#### **4.4.4 Risk management**

SGX-DC prescribes appropriate margin levels after considering the volatility of the contracts based on their historical prices and qualitative factors that may impact future volatility.

SGX-DC revalues (marks to market) all open positions on a daily basis. The main objective of marking to market is to limit the exposure of SGX-DC to price changes and not allow losses to be accumulated until maturity of the futures contracts to find that the counterparty clearing member is unable to meet its obligations.

#### **4.5 The use of the securities infrastructure by MAS**

The Singapore dollar (SGD) is managed against a trade-weighted basket of currencies of Singapore's major trading partners and competitors. MAS operates a managed float exchange regime for the SGD. In other words, there is no official peg for the value of the currency against any other currency or basket of currencies. Instead, it is allowed to fluctuate within an undisclosed policy band. The policy band is usually reviewed every six months to ensure it reflects the current underlying fundamentals of the economy. Regular review of the policy band allows MAS to continually assess the path of the exchange rate in order to avoid a misalignment in the currency value, and also gives MAS the flexibility to accommodate short-term volatility in the financial markets.

To smooth out short-term fluctuations and to avoid misalignment of the SGD exchange rate, MAS intervenes in the foreign exchange market from time to time. MAS usually engages in transactions that involve the sale or purchase of US dollars against the SGD. The policy band provides a certain amount of flexibility, which minimises the need for constant intervention. However, the buying and selling of US dollars against the SGD will have an impact on the liquidity in the banking system. To manage the liquidity in the banking system, MAS also conducts money market operations to ensure there is an appropriate level of liquidity in the banking system. The money market instruments used include foreign exchange swaps or reverse swaps, direct lending to or borrowing from banks, repurchase (repo) or reverse repurchase (reverse repo) agreements in Singapore Government Securities (SGS) and direct purchase or sale of SGS.