

PAYMENT SYSTEMS IN SINGAPORE

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List of abbreviations
Singapore Terms & Terminology

ABS	Association of Banks in Singapore. Refer to Section 1.4.2
ACENET	Refer to Section 3.2.4
ACH	Automated Clearing House. Refer to Section 1.2.2
BCCS	Board of Commissioners of Currency, Singapore. Refer to Section 1.1
BCS	Banking Computer Services Pte Ltd. Refer to Section 1.2.2
CA	Certification Authorities. Refer to Section 1.4.5
Cashcard	A multi-purpose stored value card (also known as e-money) for making small-value retail payments. Refer to Section 2.2.3.3
CCA	Controller of Certification Authorities. Refer to Section 1.4.5
CDP	Central Depository (Pte) Limited. Refer to Section 4.2.1
CTS	Cheque Truncation System. Refer to Section 3.4.1
DCSS	Debt Securities Clearing & Settlement System. Refer to Section 4.2.2
DvP	Delivery versus Payment. Refer to Section 4.2.2
ECS	Electronic Clearing System. Refer to Sections 3.2.1
EGIRO	Refer to Section 3.2.3
EPC	Electronic Payments Committee. Refer to Section 1.4.3
EPTC	Electronic Payments Technical Committee. Refer to Section 1.4.4
FOP	Free of Payment. Refer to Section 4.2.2
IBG	Interbank GIRO. Refer to Section 3.2.3
IDAS	Institutional Delivery Affirmation System. Refer to Section 4.3.3
IFT	Interbank Funds Transfer. Refer to Section 3.3.2
IOB	Internet Only Banks. Refer to Section 1.2.1
MAS	Monetary Authority of Singapore. Refer to Section 1.1
MCB	Minimum Cash Balances. Refer to Section 3.3
MEPS	MAS Electronic Payment System. Refer to Section 1.3.2
MICR	Magnetic Ink Character Recognition. Refer to Section 3.2.1
MLA	Minimum Liquid Asset. Refer to Section 3.3.1
NETS	Network for Electronic Transfers Singapore Pte Ltd. Refer to Sections 1.2.4
QFB	Qualifying Full Bank. Refer to Section 1.2.1
QOB	Qualifying Offshore Bank. Refer to Section 1.2.1
SCHA	Singapore Clearing House Association. Refer to Section 1.1 & 1.4.1
SGDCCS	Singapore Dollar Cheque Clearing System. Refer to Section 3.2.1
SGS	Singapore Government Securities. Refer to Section 1.3.3
SGX	Singapore Exchange. Refer to Section 4.2.2
S.W.I.F.T.	Society for Worldwide Interbank Financial Telecommunications. Refer to Section 1.2.5
USDCCS	United States Dollar Cheque Clearing System. Refer to Section 3.2.2

Overview

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 either stems from a trade between buyers and sellers in a market, or from a financial obligation.

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

Singapore's payment systems have 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 include cheques, interbank GIRO debit and credit transfers as well as payment cards, which includes 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.

MAS operates a real-time gross settlement (RTGS) system, MAS Electronic Payment System (MEPS), for large-value SGD interbank fund transfers and the settlement of scrippless Singapore Government Securities (SGS).

1 Institutional aspects

1.1 Legal and regulatory framework

1.1.1 *Payment instruments and systems*

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

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

- *Section 59 of Banking Act* allows the Monetary Authority of Singapore (MAS), in conjunction with banks and 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*, a 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 authorized 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)* establishes the Board of Commissioners of Currency, Singapore (BCCS) in 1967. The Act conferred on the BCCS the sole right to issue currencies 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 of 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 unauthorized alteration to the contents of electronic documents. On July 10, 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.

1.1.2 Securities settlement

The Central Depository (Pte) Ltd (CDP), a wholly-owned subsidiary of the Singapore Exchange (SGX), operates the securities clearing and settlement systems for equities traded on Singapore Exchange Securities Trading Ltd (SGX-ST) and corporate debt securities. SGX is presently authorized by MAS under the *Exchanges (Demutualization and Merger) Act* and SGX-ST, under the *Securities Industry Act*. MAS supervises CDP through its regulatory oversight of both SGX and SGX-ST, to ensure orderly and sound clearing and settlement systems.

CDP will be directly authorized as a clearing house under the *Securities and Futures Act* (SFA), which is expected to come fully into effect from April 2002. The supervisory regime over clearing houses will come under the SFA, under which MAS will have explicit powers to issue directions to and make regulations for clearing houses.

MAS is the fiscal agent of the Singapore Government. The 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 Institutions

1.2.1 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 like underwriting and distribution of equity and debt securities, corporate finance, funds 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 payments service providers are expected to play a greater role in the coming years.

Full banks

Full banks are authorized 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, travelers cheques and currencies. Full-licensed banks may also provide advice on trade and investment, 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 remaining 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 (see 3.2.5).

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 SGD250,000 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 Restricted banks in Singapore, all of which were branches of foreign banks.

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 as Full and Wholesale banks for businesses 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 can not:

- 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 SGD500 million to non-bank customers who are residents of Singapore. Qualifying Offshore banks can offer credit facilities of up to SGD1 billion.

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

Banking liberalization program

In May 1999, MAS announced a five-year program to liberalize 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 has granted Qualifying Full bank (QFB) privileges to four foreign banks, Wholesale banking licenses 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 would award another two banks QFB status and grant all QFBs enhanced privileges in branching and establishing offsite ATMs¹. In addition, from July 1, 2002, QFBs will be allowed to provide debit services on an EFTPOS services. Restricted and offshore banking licenses (including QOB) will be consolidated into a new wholesale banking license. 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 further handout another 20 wholesale banking licenses within the next 2 years, with priority accorded to existing QOBs.

(More information on the banking liberalization program, including how new licenses are granted, can be found in MAS website at www.mas.gov.sg.)

Internet only banks (IOB)

MAS issued a policy statement on Internet Banking in July 2000. MAS is prepared to grant new banking licenses 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.

1.2.2 Automated Clearing House (ACH)

The Singapore Automated Clearing House (ACH) operates the Singapore Dollar Cheque Clearing System, the United States Dollar Cheque Clearing System, and the Interbank GIRO System. The operations of the ACH are contracted to the Banking Computer Services Pte Ltd (BCS).

¹ With the second phase of banking liberalization, 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.

1.2.3 Credit / charge card operators

The main credit card operators in Singapore are VISA and MasterCard, while American Express and Diners Club are the main charge card operators. These operators provide the international network linkages between the merchant and the card issuing banks and clear their cards' transactions among participating banks. The card operators switch the transaction to the card issuers, who check the credit limit and verify the authenticity of the transaction.

1.2.4 Network for Electronic Transfers (Singapore) Pte Ltd (NETS)

NETS is a nation-wide electronic payment platform, formed in 1985 by a consortium of local banks – the Development Bank of Singapore (DBS), POSBank (POSB)², Oversea-Chinese Banking Corporation (OCBC), Overseas Union Bank (OUB) and United Overseas Bank (UOB). Tat Lee Bank and Keppel Bank joined NETS in 1990 and 1992 respectively³. NETS aims to establish infrastructure, systems and services to facilitate electronic banking services and financial payments. The company commenced operations by offering a nation-wide Electronic Funds Transfer at Point Of Sale (EFTPOS) network, an online debit payment service.

Over the years, NETS has evolved to a multi-service organization, providing a comprehensive range of electronic payment services such as EFTPOS, CashBack, Shared ATM service, CashCard, SET Payment Gateway, NETSCash and Trade Finance service etc.

1.2.5 SWIFT

The Society for Worldwide Interbank Financial Telecommunications (SWIFT) was founded by 239 banks from 15 countries in 1973, with the purpose of providing technology-based communication services across all financial markets through member banks. Today, S.W.I.F.T. provides secure global communication to more than 7,200 financial institutions in 192 countries. The services provided include interfaces, store-and-forward messaging, interactive messaging, file transfers and message routing.

SWIFT was introduced in Singapore in 1979, and by 1983 fifty banks were connected to the network. As at end of December 2000, there were 179 domestic institutional users, of which nine were locally incorporated institutions participating as full members. The remaining domestic institutional users were sub-members and participants, consisting of foreign commercial banks, investment advisors, securities houses and other financial institutions.

1.2.6 Central Depository Pte Ltd (CDP)

Established in 1987, the Central Depository (Pte) Ltd (CDP), a wholly-owned subsidiary of the Singapore Exchange (SGX), operates the securities clearing and settlement systems for equities and corporate debt securities. CDP clears and settles trades in equities listed on a related entity, SGX Securities Trading (SGX-ST), which is also a wholly-owned subsidiary of SGX. CDP acts as the central counterparty for the clearing and settlement of these equities trades. At the same time, CDP provides a clearing and settlement facility for corporate debt securities, but does not function as a central counterparty for this purpose.

² POSB was acquired by DBS in 1998.

³ Keppel Bank and Tat Lee Bank merged in 1999.

Settlement of all SGX-ST traded equities and corporate debt securities is conducted by CDP via a book-entry settlement system.

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 of December 2000, SCHA had 48 ordinary members and 87 associate members. The SCHA also establishes the rules on the rights and responsibilities of participating banks as well as the service providers for the various clearing systems.

The SCHA is responsible for the Singapore Automated Clearing House (ACH), which runs the Singapore Dollar Cheque Clearing System, the United States 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 issues on payment and settlement systems.

1.3.3 Electronic Payments Technical Committee (EPTC)

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
- ePayment infrastructure, systems and services
- Electronic-commerce
- Mobile-commerce
- Public Key Identification/Certification Authority infrastructure, interoperability and connectivity

Member organizations 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 organizations 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 Transaction Act, the CCA oversees the activities of certification authorities (CA), by licensing, certifying, monitoring developments and using other controls.

The licensing scheme for CA 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 get a license would need to 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.

2 Payment methods

2.1 Cash

Like most countries, currency remains the most accepted means of payment medium for small value transactions in Singapore.

BCCS has the sole right to issue currency and coins in Singapore.

Notes in circulation are denominated in SGD1, SGD2, SGD5, SGD10, SGD20, SGD50, SGD100, SGD500, SGD1,000, SGD5,000 and SGD10,000. Coins are issued in denominations of SGD0.01, SGD0.05, SGD0.10, SGD0.20, SGD0.50 and SGD1.00. SGD0.01 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 include gold and other foreign currencies.

2.2 Non-cash payments

2.2.1 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 Automated Clearing House 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, the Automated Clearing House (ACH) processed 91 million cheques with a total value of SGD453 billion.

2.2.2 GIRO

The Interbank GIRO (IBG) system was launched in April 1984. It is an offline interbank payment system catering for mainly 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.

Direct debit transfers

In debit transfers, the payee instructs his bank to collect payment from the paying party, often on a recurring basis. Direct Debit payments are pre-authorized 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 pre-authorized recurring payments include utility bill payments or payments for telecommunication services.

Direct credit transfers

In credit transfers, the payer instructs his bank to debit his account and transfer the fund to the payee. In Singapore, most credit transfers are standing order arrangements made by the originator 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.

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, with a value of SGD72 billion.

2.2.3 Payment cards

Credit cards

All major credit cards are offered in Singapore. The issuance of credit cards is subject to MAS guidelines and regulations. MAS issues guidelines and regulations on credit card related issues such as the eligibility criteria of card applicants and marketing of credit cards.

Total credit card transactions amount to SGD10.5 billion in year 2000.

Debit cards

Debit cards are broadly categorized 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 through an Automatic Teller Machine (ATM) or an Electronic Funds Transfer at Point of Sale terminal (EFTPOS). The payment or cash withdrawal is effected through an on-line transfer of funds from the cardholder's account. *(Please see section 2.2.4 and 2.2.5 for more information on ATMS and EFTPOS.)*

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

Stored Value Cards

Stored Value Cards (also known as e-money) in Singapore are categorized into Single Purpose Stored Value Cards (SPSVC) and Multi-Purpose Stored Value Cards (MPSVC). Examples of SPSVCs are prepaid phone cards that can only be used to pay for goods and services offered by the issuer. In contrast, a MPSVC allows cardholders to pay for goods and services offered by the issuer as well as merchants or organizations other than the MPSVC issuer.

CashCard is a MPSVC which was launched in November 1996 and it is jointly issued by the 3 local banks⁴. CashCard 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 also be used for online purchases with the use of a card reader. The CashCard can be re-used by topping up its value to a maximum of SGD500 at ATMs, selected EFTPOS terminals, automated kiosks⁵ 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 with a total value of SGD174 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.

2.2.4 Automated Teller Machines (ATM)

Automated Teller Machines (ATM) 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. Some of the local banks share a common ATM network. MAS limits the number of ATMs owned by foreign banks.

Since their introduction, ATMs have played a major role in promoting a cashless society and in bringing greater convenience to customers. ATMs allow consumers greater ease in making deposits to and withdrawals from their bank accounts. In addition, ATMs also 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.

⁴ The Development Bank of Singapore, Oversea-Chinese Banking Corporation Ltd and United Overseas Bank.

⁵ These automated kiosks include CashCard Automated Machines, NETS Kiosks and CashCard Service Terminals.

2.2.5 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 in 1986 by NETS. EFTPOS is a debit card system allowing an ATM cardholder to use his ATM card to pay a merchant for the purchase of goods and services through an on-line transfer of funds from his account.

By year-end 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 SGD4.8 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 five local banks.

2.2.6 Other access channels for banking and payments

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 (COE)⁶.

Mobile banking

More recently, bank customers are 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 the payer pre-registering their credit card account details with their mobile payment service provider. The payer can then make payments using an ID and PIN as authentication and the payment is processed as a traditional credit card transaction. Another method is one that allows the mobile payment to be reflected as another item in the payer's phone bill.

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 using their normal Internet Banking systems.

⁶ To own a vehicle in Singapore, a COE is required. COEs are awarded based on monthly bidding.

3 Interbank settlement systems

3.1 General overview

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

- a) The Singapore Clearing House Association (SCHA) provides three payments clearing and settlement systems for its member banks. They are the:
 - Singapore Dollar Cheque Clearing System;
 - United States Dollar Cheque Clearing System; and
 - Interbank GIRO System.
- b) NETS manages the clearing process for the local retail payment systems such as the local banks' ATM networks, EFTPOS and CashCard networks.
- c) MAS operates the settlement system for large-value interbank fund transfers, i.e. the MAS Electronic Payment System (MEPS).

The clearing systems provided by the SCHA are operated by the Automated Clearing House (ACH). 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 ACH and MEPS to facilitate daily multilateral net settlement of these payment obligations on a deferred same day basis.

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

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, however for Cashcard transactions, settlement may occur the next day.

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 Delivery-versus-Payment (DvP) basis via interfaces to the interbank funds transfer system in MEPS (see section 4.2).

3.2 Interbank systems for retail transactions

3.2.1 *Singapore Dollar Cheque Clearing System*

The current operator for the Singapore Dollar Cheque Clearing System (SGDCCS) is Banking Computer Services Pte Ltd (BCS). Direct participation in the SGDCCS is only available to Ordinary members of the Singapore Clearing House Association (SCHA). 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 first 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 ACH 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 in 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 SGD 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. Payer sends a cheque to 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 ACH. For banks sending ECS data, the corresponding physical cheques can be sent to ACH later in the day.
4. After clearing the cheques and determining the net settlement amount for each participating bank, ACH sends the net clearing figures to MEPS for broadcast and settlement.
5. ACH 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 ACH by 12:00 the next day.
7. ACH 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 ACH 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.

ACH transmits 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 ACH for mid-day clearing is 14:30 on weekdays (there is no mid-day clearing on Saturdays). Mid-day 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 ACH; 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 accrues 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, i.e. only if the cheque has been dishonored (*see points 6 and 7 above*). Generally, "cleared funds" are released at 14:00 the next business day.

3.2.2 USD Cheques

The US Dollar Cheque Clearing System (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 US dollar cheque from the previous two to four weeks to only three days. BCS and Citibank 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 with minimum balances of USD 10,000.

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

1. USD cheques are delivered to ACH by presenting banks.
2. At the end of the first day, ACH 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 the participating bank's account. Participating banks are required to meet any projected shortfall.
4. ACH 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, however the funds are not considered "cleared funds" until the end of day three.
5. All returned unpaid USD cheques are delivered to the ACH at the latest by the morning of the third business day.
6. ACH 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 after their deposit.

3.2.3 Interbank GIRO (IBG)

Interbank GIRO (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 ACH introduced the eGIRO system, which removes the manual delivery of magnetic tapes between the banks and the ACH 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 ACH for clearing.
3. After determining the net settlement amount for each participating bank, ACH sends the net clearing figures to MEPS for broadcast and settlement.
4. ACH forwards the payment instructions to Receiving Banks for the credit/debit of the Second Party's account.
5. If the payment instruction is rejected, the Receiving Bank will return the rejected instruction to the Originating Bank through ACH the next day. ACH will adjust the settlement amount for both banks before forwarding the rejected instruction to 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 session on Saturdays. Participants are required to send payment instructions to ACH by 12:00 on weekdays and 9:00 on Saturdays. The ACH 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 again broadcast 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.

3.2.4 ATM networks

Most banks in Singapore have proprietary ATM networks, however 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 among the other four local banks (United Overseas Bank, Oversea-Chinese Banking Corporation, Overseas Union Bank, Keppel-Tat Lee Bank). In November 2000, these four banks announced plans to consolidate their offsite ATMs under a new entity called ACENET. ACENET will market and manage ATM services for an integrated off-site ATM network. Its implementation is expected to lead to cost savings through economies of scale for the participating banks. It will provide operational and technical services such as ATM cash replenishment, machine maintenance, upgrade of the network as well as the development of infrastructure and other ATM related services.

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 authorization, 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 a cardholder performs a transaction at his own bank's ATM, the transaction does not require any switching, as the issuing bank is able to directly approve the transaction.

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

3.2.5 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 will vary depending on the card type used in the transaction:

- For debit cards issued in Singapore, NETS dispatches the transaction for authorization 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 merchants of the successful transaction, who in turn delivers the goods/services to the cardholder.
- For Maestro cards and Amex and Diners charge cards, NETS routes the transaction to the card processor according to the branding. The card processor, on behalf of the issuing bank, checks the payment limit, verifies that the transaction is not fraudulent and authorizes the merchant to deliver the good/services.

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

1. NETS first performs multilateral netting to determine a net settlement amount for each member bank.
2. The net amount is then submitted to DBS for debiting/crediting of the member banks' accounts.
3. Member banks then manage their Nostro accounts at DBS through MEPS.

3.3 Real-time gross settlement system - MAS Electronic Payment System (MEPS)

The 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 scripless 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' intra-day Minimum Cash Balances⁷ (MCB) requirement is maintained in the Reserve Account. Funds exceeding the intra-day 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 intra-day basis, banks may also draw down the full MCB amount in their Reserve Account to make payments.

3.3.1 Participants

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. To do so, non-participating banks may enter into private agency agreements with any of the participating banks. The terms of such agreements are bilaterally negotiated between the banks, and are outside the ambit of the 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 Assets⁸ (MLA) accounts respectively.

There were 90 participating banks in MEPS as at December 2000. The daily turnover value for MEPS averages around SGD35 billion and the average daily volume of transactions is around 7,000.

3.3.2 MEPS –Interbank Funds Transfer (MEPS-IFT)

MEPS consists of two subsystems namely, MEPS Interbank Funds Transfer (MEPS-IFT) subsystem and MEPS Singapore Government Securities – Delivery vs. Payment (MEPS-SGS) subsystem. The MEPS-SGS subsystem is described in more detail in Section 4.2.3.

Under the MEPS-IFT sub-system, 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.

⁷ Pursuant to Section 40 of the Banking Act, all banks in Singapore are required to maintain minimum cash balances (MCB) with MAS of not less than 3% of the total liabilities.

⁸ Under Banking Act Chapter 19, as part of the MLA requirements, all banks in Singapore must hold Singapore Government Securities at least equal to 10% of total liabilities (10% SGS includes both outright holdings of SGS as well as those held under reverse repo transactions).

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

3.3.3 Credit and liquidity risks and their management

To minimize 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. The intraday credit from MAS must be collateralized with SGS. Such credit is extended at MAS' sole discretion. When deciding whether to extend the 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 to be charged on the overnight repurchase transaction will be 2% above the reference rate. The reference rate is the 1-month SGD SIBOR fixed by the Association of Banks in Singapore (ABS) at 11:00 Singapore time on the same working day.

3.3.4 Management and pricing

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.

Participating banks are charged on a cost recovery basis. A flat fee is charged for each message, payable by the bank initiating the MEPS 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.

3.3.5 Operations of MEPS

Each participating bank has a front-end system, which is 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 will be placed in a queue with a priority assigned by the participating bank. All queued instructions will then be settled in accordance to their assigned priority levels on a first-in-first-out (FIFO) basis. The queuing mechanism has the following levels of priority:

- 1 - MAS transactions
- 2 - Cheque/Interbank GIRO (IBG) transactions
- 3 - Banks' urgent transactions
- 4 - SGS transactions
- 5 - Banks' normal transactions
- 9 - Banks' payments on hold

Participants are only able to re-prioritize 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, allowing its priority 5 payments to be settled first.

The operating hours of the MEPS-IFT sub-system are between 9:00 to 18:30 on Mondays to Fridays, and between 9:00 to 14:45 on Saturdays.

3.4 Special use of interbank transfer systems for international payments

3.4.1 *Traveler's cheques & personal cheques*

Full-licensed banks both offer and accept for negotiation, traveler's cheques that are denominated in major currencies. Visitors from foreign countries can visit these banks to either buy traveler's cheques, or negotiate their traveler's cheques with the banks.

Other than personal and cashier cheques that are drawn on participating banks of the ACH, all other cheques will be settled via correspondent banking.

3.4.2 *International ATM network*

Many ATM terminals are part of the Cirrus and Plus networks operated by MasterCard and VISA respectively. Overseas Credit and Debit cardholders whose cards have such affiliations are able to withdraw local currency via these ATM terminals. Similarly, the credit and debit cards issued by Singapore financial institutions carrying these signs can also be used abroad.

The operating hours of the MEPS-IFT sub-system are between 9:00 to 18:30 on Mondays to Fridays, and between 9:00 to 14:45 on Saturdays.

3.5 Main projects and policies being implemented

3.5.1 *Cheque truncation*

The Singapore Clearing House Association and the Association of Banks in Singapore are jointly developing a Cheque Truncation System targeted for implementation in September 2002. The Cheque Truncation System is a cheque clearing system where electronic images of the cheques are captured at point of deposit and transmitted throughout the entire clearing process. Physical movement of paper cheque 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 debts, equity securities and some related derivative products.

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

- a) The MEPS-SGS subsystem at MAS clears and settles SGS trades on a DVP basis.

- b) The CDP is the clearing house for the Singapore equities, corporate bond securities and derivatives markets and has the following systems for clearing and settlement of equities and corporate bond securities:
- 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) is an electronic book-entry system for the custody and settlement of Singapore dollar statutory board and corporate bonds, and
 - Clearing Operations and Risk Evaluation system (CORE) is the clearing system for all derivatives contracts.

4.1 Singapore government securities

MAS acts as the agent for the Government of Singapore in issuing SGS that comprise Treasury bills (T-bills) and Government bonds. Maturities range from 3 months to 15 years with 3-month and 1-year benchmarks for T-bills and 2-, 5-, 7-, 10- and 15-year benchmarks for bonds. Since May 2000, MAS' issuance program has aimed to build large and liquid benchmark bonds. This has been achieved through larger issuances of new SGS bonds and re-openings of existing issues, thereby enlarging the free float of SGS available for trading.

4.1.1 Trading

MAS issue T-bills and bonds on a regular basis. 3-month T-bills are issued weekly, whilst 1-year T-bills, 2-, 5-, 7-, 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. Provide liquidity to the SGS market by quoting two-way prices under all market conditions;
- ii. Underwrite issuance at SGS auctions;
- iii. Provide market feedback to MAS; and
- iv. Assist 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 the MEPS-SGS system. The bond buyer will confirm 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 of SGS involves a transfer of SGS without a corresponding funds transfer instruction.

The MEPS-SGS system opens at 9.00 daily to process SGS transactions with payments. Participating banks of MEPS need to maintain two accounts in the MEPS-SGS sub-system:

- **SGS-MLA Account**

To maintain SGS for compliance with the MLA requirements.⁹

- **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 percent 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 is 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 sub-system will simultaneously notify the MEPS-SGS sub-system to transfer the securities to the purchasing bank. Settlement date convention for SGS transactions is T+1.

4.2 Corporate and statutory boards bond

4.2.1 Trading

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

⁹ Please refer to footnote 8.

4.2.2 *Pre-settlement*

Both the securities buyer and seller input the settlement instruction, containing key details of the trade into the Debt Securities Clearing & Settlement System (DCSS). Upon matching of the settlement instructions, the seller's debt securities are earmarked and the transaction proceeds on to settlement. Matched instruction 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. Bonds transactions can be settled on a DVP or FOP basis. All exchange-listed corporate debt securities 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 will separately arrange for funds transfer.

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. Bonds 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 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-members 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 capitalization of SGD361 billion.

All securities certificates are deposited with CDP, a subsidiary of the SGX. Under the scripless settlement system, crediting or debiting the owner's account through computerized 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 right 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 of Clearing and Settlement Framework:

- SGX Member Companies
SGX member companies' participation in the system is compulsory.
- Clearing Members
Only SGX members companies are clearing members of CDP.
- Principals
Principals are companies approved by CDP to settle trades on a DvP basis for their clients. Participation is optional and is by application to CDP. Eligible companies are the custodian banks. To settle trades on a DvP basis, the custodian bank must have access to the clearing and settlement system to affirm trades on a DvP basis, and a settlement bank to settle payment with 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 “free” balance to “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.

Risk Management

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 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.

All equities settlements in IDAS are performed on a DVP basis. In addition, CDP has a Clearing Fund that is applied in the event a clearing member is unable to discharge its money 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 director 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, providing 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 who 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 in that day and on open positions brought forward using the settlement price. Every clearing member’s margin requirements are subsequently re-computed.

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 if 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.

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 all open positions on a daily basis (called 'Marked-to-Market (MTM)'). The main objective of carrying out MTM 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 out that the counter-party Clearing Member is unable to meet its obligations.

4.5 The use of the securities infrastructure by the MAS

The Singapore dollar (SGD) is managed against a trade-weighted basket of currencies of Singapore's major trading partners and competitors. The 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 6 months to ensure it reflects the current underlying fundamentals of the economy. Regular review of the policy band allows the MAS to continually assess the path of the exchange rate in order to avoid a misalignment in the currency value, and also gives the 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, the 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 minimizes 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 (repos) or reverse repurchase (reverse repos) agreements in Singapore Government Securities (SGS) and direct purchase or sale of SGS.

4.6 Major projects and policies being implemented

4.6.1 Straight-Through-Processing (STP)

SGX started its STP project in January 2001 by forming an industry-working group to develop the business case report. The 'Baseline Vision' of the STP initiative includes developing common messaging standards; developing the Participant Access Module (PAM) and building the Central Pre-Matching Utility (CPM). The STP Business Case report is finalised and SGX will also be finalising the business and technical architectures.

5. Role of the central bank

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. Except for the issuance of currency, which is entrusted to BCCS, MAS performs all the functions normally associated with a central bank.

5.1 Provision of settlement facilities

The 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 the MAS. The MAS is also the operator of the MAS Electronic Payment System (MEPS), Singapore's high value RTGS system (see section 3.3).

MEPS is also designed to handle the settlement of scripless Singapore Government Securities (SGS). Participating banks hold SGS accounts with MAS, which are debited or credited with SGS when transactions are executed. Payment obligations that arise from trading in Singapore Government Securities and in other SGD denominated corporate debt may be settled on a Delivery-versus-Payment (DVP) basis via interfaces to the interbank funds transfer system in MEPS (see sections 4.2 and 4.3).

The MAS also handles government-related payments and receivables that usually take the form of funds transfers between the accounts of the government's accounts with the MAS and with the banks.

5.2 MAS role in the 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 multi-purpose 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 good working relationships with payment system participants and stakeholders which complements its legislative roles in the respective systems. MAS often relies on extensive industry consultation to ensure its objectives for the payment system are achieved.

MAS also has legislative powers with respect to securities clearing and settlement systems, as outlined in Section 1.1.2. MAS' oversight responsibilities and regulatory powers for securities clearing and settlement systems will be significantly enhanced with the *Securities and Futures Act*, which is expected to come fully into effect from April 2002.

5.3 Monetary policy & payment system

Singapore's monetary policy aims to promote sustained and non-inflationary growth for the Singapore economy and is centered on the exchange rate.

MAS manages the Singapore dollar against a basket of currencies of Singapore's main trading partners and competitors. The trade-weighted Singapore dollar is allowed to float within an undisclosed target band. MAS reviews the level and width of the band periodically to ensure that it is consistent with economic fundamentals and market conditions. MAS also intervenes in the foreign exchange market from time to time to ensure that movements of the Singapore dollar exchange rate are orderly and consistent with the exchange rate policy. The MAS manages the bulk of Singapore's official foreign reserves, except for foreign assets held by BCCS to back the currency in circulation.

Other monetary policy instruments include the discount rate, open market operations and reserve requirements for deposit taking institutions as provided by the Banking Act.

The ability of the MAS to implement monetary policy and effectively regulate the supply of SGD liquidity in the banking system relies on the availability of a robust and efficient technological and institutional framework, or transmission mechanism. Singapore's RTGS system, MEPS, is the interbank payment system through which MAS carries out its monetary operations, and to this extent, it is important that the system is designed and operated in such a way that does not create unanticipated or unnecessary delays or difficulties for MAS to achieve its monetary policy objectives.

Changes in specific design aspects of the payment system can give rise to implications for the conduct of monetary policy. To this extent, MAS ensures that any changes to the payment system are pursued in a coordinated and complementary manner with monetary policy implementation processes.

STATISTICAL TABLES

Singapore

Table 1

Basic statistical data

	1996	1997	1998	1999	2000
Population (thousands)	3,670	3,794	3,922	3,951	4,018
GDP (SGD millions)	128,201	140,228	137,464	142,111	159,042
GDP per capita	34,928	36,963	35,050	35,969	39,585
Exchange rate vis-à-vis USD:					
<i>year-end</i>	1.3998	1.6755	1.6605	1.6660	1.7315
<i>average</i>	1.4089	1.4973	1.6730	1.6975	1.7288

Table 2

Settlement media used by non-banks

(end of year)

	1996	1997	1998	1999	SGD millions 2000
Banknotes and coins ¹⁾	10,293	10,704	10,146	11,315	11,289
Transferable deposits ²⁾	16,747	16,807	17,093	19,794	21,973
Others	nap.	nap.	nap.	nap.	nap.
Narrow Money Supply (M1) ³⁾	27,040	27,511	27,239	31,109	33,262
Memorandum items:					
Broad money supply (M3) ⁴⁾	148,495	160,766	173,581	186,184	182,913
Transferable deposits in foreign currencies	759	809	485	551	563
Outstanding value on e-money schemes					
of which:					
<i>on card-based products</i> ⁵⁾	2	6	24	28	38
<i>on network-based products</i>	nap.	nap.	nap.	nap.	nap.

¹⁾ Currency in active circulation.

²⁾ Demand deposits of private non-bank customers resident in Singapore.

³⁾ Currency in active circulation and demand deposits.

⁴⁾ Summation of M1, finance companies and Post Office Savings Bank's (POSB) net deposits with non-bank financial institutions as well as total quasi money. POSB merged with the Development Bank of Singapore Limited in 1998.

⁵⁾ Outstanding NETS CashCard proceeds.

Table 3

Settlement media used by banks

(end of year)

	1996	1997	1998	1999	SGD millions 2000
Transferable balances held at central bank	7,095	7,702	5,431	7,524	5,691
of which:					
<i>required reserves</i>	7,052	7,606	4,339	5,942	5,376
<i>free reserves</i>	43	96	1,092	1,582	315
Transferable balances held at other banks	nav.	nav.	nav.	nav.	nav.
Memorandum item:					
Institutions' borrowing from central bank	0	255	63	30	165

Table 4

Institutional framework

(end of 2000)

Categories	Number of institutions	Number of branches	Number of accounts	Value of accounts (SGD billions)
Central bank	1	1	140 ¹⁾	5.69
Credit institutions	217 ²⁾	702 ²⁾	nav.	184.96 ³⁾
of which:				
banks ²⁾	140 ²⁾	538 ²⁾	nav.	171.32 ³⁾
merchant banks	63 ²⁾	63 ²⁾	nav.	nav.
finance companies	14 ²⁾	101 ²⁾	nav.	13.65
Postal institution	nap.	nap.	nav.	nav.
Total	218	703	nav.	nav.
of which:				
virtual institutions	1	nap.	nav.	nav.
Branches of foreign banks	132 ²⁾	201 ²⁾	nav.	nav.

¹⁾ Includes local and foreign banks.²⁾ As at end March 2000.³⁾ Non-bank customer deposits.

Table 5

Payment instructions handled by selected interbank funds transfer systems: volume of transactions

	1996	1997	1998	1999	millions 2000
Singapore dollar cheque clearing system	82.50	87.52	87.34	92.18	91.26
United States dollar cheque clearing system	0.11	0.19	0.28	0.38	0.39
IBG clearing system	32.11	36.48	34.44	29.38	29.98
EFTPOS	42.39	50.86	57.90	65.74	76.93
Shared ATM	13.80	15.20	15.50	10.10	8.54
SHIFT / MEPS ¹⁾	1.54	1.80	1.88	1.87	1.91

¹⁾ MEPS replaced SHIFT in July 1998.

Table 6

Payment instructions handled by selected interbank funds transfer systems: value of transactions

	1996	1997	1998	1999	SGD billions 2000
Singapore dollar cheque clearing system	581.08	608.44	459.24	489.28	453.22
United States dollar cheque clearing system ¹⁾	4.87	10.98	12.23	15.08	21.12
IBG clearing system	59.98	73.84	69.50	66.10	72.12
EFTPOS	2.79	3.44	3.53	4.10	4.75
Shared ATM	3.00	3.40	3.50	2.40	2.04
SHIFT / MEPS ²⁾	7,612.74	9,729.34	9,042.94	9,236.62	9,580.52

¹⁾ Aggregated figures converted at end of year exchange rate.²⁾ MEPS replaced SHIFT in July 1998.

Table 7

Indicators of the use of various cashless payment instruments: volume of transactions

	1996	1997	1998	1999	millions 2000
Instruments					
Cheques ^{1,2)}	82.61	87.71	87.62	92.56	91.65
Payments by debit card ³⁾	56.19	66.06	73.40	75.84	85.47
Payments by credit card	nav.	nav.	nav.	nav.	nav.
Credit transfers ^{1,4)}	13.55	15.08	15.65	13.89	14.60
Direct debits ^{1,5)}	20.10	23.20	20.66	17.36	17.29
Card-based electronic money	0.03	0.68	26.32	76.96	100.10
Network-based electronic money	nav.	nav.	nav.	nav.	nav.
Total	nav.	nav.	nav.	nav.	nav.

¹⁾ Interbank transactions only.²⁾ Include both SGD and USD cheques.³⁾ Summation of Shared ATM and EFTPOS transactions.⁴⁾ Summation of IBG and MEPS transactions.⁵⁾ Interbank Giro transactions.

Table 8

Indicators of the use of various cashless payment instruments: value of transactions

	1996	1997	1998	1999	SGD billions 2000
Instruments					
Cheques ^{1,2,3)}	585.95	619.42	471.47	504.36	474.33
Payments by debit card ⁴⁾	5.79	6.84	7.03	6.50	6.79
Payments by credit card ⁵⁾	6.99	7.92	7.69	8.95	10.56
Credit transfers ^{1,6)}	7,657.80	9,784.53	9,096.94	9,287.64	9,633.94
Direct debits ^{1,7)}	14.91	18.65	15.50	15.08	18.69
Card-based electronic money	neg.	0.01	0.04	0.09	0.17
Network-based electronic money	nav.	nav.	nav.	nav.	nav.
Total	8,271.44	10,437.37	9,598.67	9,822.62	10,144.49

¹⁾ Interbank transactions only.²⁾ Include both SGD and USD cheques.³⁾ USD cheques converted at end of year exchange rates.⁴⁾ Summation of Shared ATM and EFTPOS transactions.⁵⁾ Include credit and charge cards.⁶⁾ Summation of IBG and MEPS transactions.⁷⁾ Interbank Giro transactions.

Table 9

Transfer instructions handled by securities settlement systems: volume of transactions

	1996	1997	1998	1999	2000
SGX (millions of securities traded)	33,066	52,232	74,244	155,803	99,301
CDP (millions of securities)	33,066	52,232	74,244	155,803	99,301
DCSS	nap.	nap.	92	627	1,666
Securities) ¹⁾	0.02	0.02	0.02	0.02	0.02

¹⁾ MEPS replaced SHIFT in July 1998.

Table 10

Transfer instructions handled by securities settlement systems: value of transactions

	1996	1997	1998	1999	SGD billions 2000
SGX	88.8	114.3	98.7	196.9	172.0
CDP	88.8	114.3	98.7	196.9	172.0
DCSS	nap.	nap.	0.2	0.9	5.0
SHIFT/MEPS ¹⁾	nav.	nav.	62.0 ²⁾	144.1	173.5

¹⁾ MEPS replaced SHIFT in July 1998.

²⁾ From July 1998 to December 1998.

Table 11

Number of participants in securities settlement systems

	1996	1997	1998	1999	2000
SGX					
Members companies	33	33	31	30	32
Stockbroking members	118	122	108	111	126
Dealers	830	867	868	1,052	1,118
Remisers	2,265	2,323	2,240	2,443	2,530
CDP					
CDP depositors (in thousands) ¹⁾	920	948	980	1,012	1,080
CDP depository agents ¹⁾	99	93	95	90	87
DCSS	nap.	nap.	53	57	63
SHIFT / MEPS ²⁾	143	152	154	142	140

¹⁾ As at end of June.

²⁾ As at end of March. MEPS replaced SHIFT in July 1998.