



**HONG KONG MONETARY AUTHORITY**

**PAYMENT, CLEARING AND SETTLEMENT  
SYSTEMS IN HONG KONG**

**April 2011**



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## List of abbreviations

AI	Authorized Institution
ATM	Automatic Teller Machine
CB	Clearing Bank
CCASS	Central Clearing and Settlement System
CCPMP	Cross Currency Payment Matching Processor
CHATS	Clearing House Automated Transfer System
CLS	Continuous Linked Settlement
CMT	CMU User Terminal
CMU	Central Moneymarkets Unit
CMUP	Central Moneymarkets Unit Processor
CNS	Continuous Net Settlement
CSD	Central Securities Depository
CSSO	Clearing and Settlement Systems Ordinance
DTC	Deposit-Taking Company
DTCA	DTC Association
DVP	Delivery versus Payment
EFBNs	Exchange Fund Bills and Notes
EPS	Easy Pay System
FOP	Free-of-payment
GEM	Growth Enterprise Market
HKAB	Hong Kong Association of Banks
HKEx	Hong Kong Exchanges and Clearing Limited
HKFE	Hong Kong Futures Exchange
HKICL	Hong Kong Interbank Clearing Limited
HKMA	Hong Kong Monetary Authority
HKSCC	Hong Kong Securities Clearing Company Limited
IFTP	Interbank Fund Transfer Processor
LBs	Licensed Banks
MMs	Market Makers
MPC	Multi-purpose stored value card
OCL	Octopus Cards Limited
OTC	Over-the-counter
POS	Point-of-Sales
PVP	Payment versus Payment
RDs	Recognised Dealers
RLBs	Restricted Licence Banks
RTGS	Real Time Gross Settlement
SAP	Settlement Account Processor
SEHK	Stock Exchange of Hong Kong
SFC	Securities and Futures Commission
SI	Settlement Institution



## 1. Introduction

Hong Kong has developed a financial infrastructure expediting economic transactions and financial intermediation in the region and introduced a number of improvements to smooth payment flows and enable banks to use liquidity more efficiently. The platform, which handles real-time transactions in the major foreign currencies and the Hong Kong dollar, covers diverse financial intermediation channels including banking, equity and debt. It helps consolidate Hong Kong's position as an international financial centre and a settlement hub of the region.

The system components of Hong Kong's financial infrastructure fall into three broad types; payment systems for the settlement of interbank payments, debt securities settlement systems for the settlement and custody of debt securities and system links to provide payment-versus-payment (PVP) and delivery-versus-payment (DVP) services, as well as external links to facilitate cross-border transactions.

### 1.1 The general institutional network

There are specific legal and regulatory requirements for overseeing important payment systems in Hong Kong. Moreover, there are a number of laws that have direct bearing on various payment instruments and institutions. The relevant ordinances and regulations are set out in the following sections.

#### 1.1.1 Payment systems and instruments

##### Oversight of designated systems

The *Clearing and Settlement Systems Ordinance (CSSO)*, which came into force in November 2004, empowers the Hong Kong Monetary Authority (HKMA) to designate and oversee clearing and settlement systems that are material to the monetary or financial stability of Hong Kong, or to the functioning of Hong Kong as an international financial centre. The purpose of the CSSO is to promote the general safety and efficiency of the designated systems. The CSSO also provides statutory backing to the finality of settlement for transactions made through systems designated under the Ordinance by protecting the settlement finality from insolvency laws or any other laws.

##### Informal oversight of retail payment systems

Compared with large-value interbank payment systems, the retail payment systems, which handle large volumes of transactions of relatively low value, generally carry few, if any, systemic risks. The HKMA therefore considers that retail payment systems are in general not systemically significant enough for the time-being to be designated under the CSSO. However, the HKMA encourages the retail payment industry to adopt a self-regulatory approach by issuing codes of practice to promote safety and efficiency of the system. The *Code of Practice for Multi-purpose Stored Value Card Operation*, which came into effect in August 2005, sets out the principles covering operational reliability, data security, and the efficiency and transparency of multi-purpose stored value card (MPC) issuers, system operators and merchant acquirers in Hong Kong. The *Code of Practice for Payment Card Scheme Operators*, which came into effect in January 2007, sets out the principles covering operational reliability, data and network security, and the efficiency and transparency of credit and debit card operations of card scheme operators in Hong Kong. The HKMA monitors the overall compliance of the industry with the two codes of practice.

## **Other relevant ordinances and regulations**

Section 3A(1) of the *Exchange Fund Ordinance* provides, inter alia, that the Financial Secretary may, by notice, require an authorized institution (AI) (see section 1.2.2) to open an account (“Settlement Account”) with the Monetary Authority and to maintain and operate such Settlement Account on such terms and conditions as the Financial Secretary considers appropriate. The Financial Secretary has delegated this power to the Monetary Authority.

*Legal Tender Notes Issue Ordinance* regulates the issue of banknotes and currency notes. Under the ordinance, the banknotes issued by the Bank of China (Hong Kong) Limited, the Standard Chartered Bank (Hong Kong) Limited and The Hongkong and Shanghai Banking Corporation Limited (HSBC) are legal tender within Hong Kong.

The legal definition of a cheque is stipulated in the *Bills of Exchange Ordinance*. According to Section 73(1) of the Ordinance, a cheque is a bill of exchange drawn on a banker payable on demand.

The *Banking Ordinance* provides the HKMA with the power to regulate the issue of MPC in Hong Kong. The regulatory regime aims to ensure the soundness of MPC schemes and the soundness of the issuers. The Ordinance provides that licensed banks (LBs) are deemed to be approved to issue or facilitate the issue of MPC, and that a special purpose vehicle whose principal business is or will be the issuing or facilitating the issue of MPC may apply for authorization as a deposit-taking company (DTC) in order to be approved to conduct that business.

In developing this regulatory framework, the HKMA seeks to strike a balance between the need to maintain the stability of the payment system (and thus of the financial system as a whole) and the desirability of not stifling developments which would promote competition and innovation of MPC in Hong Kong.

### **1.1.2 Securities settlement**

The Securities and Futures Commission (SFC) administers Hong Kong's securities and futures legislation.

The SFC has oversight responsibility for the Hong Kong Exchanges and Clearing Limited (HKEx) and its subsidiaries, namely The Stock Exchange of Hong Kong (SEHK), the Hong Kong Futures Exchange (HKFE) and their Clearing Houses. It also has front-line regulatory responsibility for takeovers and mergers activity, regulation of offers of investment products, and the enforcement of laws regarding market malpractices. Since 6 March 2000, the SFC has taken over the front-line regulation of all exchange participants from the two exchanges. As for listed companies, SEHK is the front-line regulator for all companies listed on the Main Board and the Growth Enterprise Market (GEM), except the HKEx, which is regulated by the SFC.

In February 2001, the SFC signed a Memorandum of Understanding (MOU) with the HKEx. The MOU covers matters relating to the supervision of exchange participants, market surveillance and oversight of the activities of the HKEx, the two exchanges and clearing houses, including their rule making powers. There is a separate MOU between the two parties regarding listing matters.

Among its other regulatory responsibilities in relation to the HKEx, the SFC's Enforcement Division monitors trading on the two exchanges with a view to detecting and understanding unusual price and volume movements, and conducts investigations if necessary; the Intermediaries Supervision Department (ISD) conducts routine inspection visits of exchange participants (as well as other intermediaries who are not exchange participants) to ensure that intermediaries comply with regulatory requirements; ISD also conducts annual review on the operations of the depository and nominee services provided by Hong Kong Securities Clearing Company Limited (HKSCC) (a subsidiary of HKEx); and the Supervision of Markets Division oversees the operations of the HKEx and its subsidiaries to ensure the sound functioning of their trading, settlement and operational systems.

## **1.2 The role of HKMA**

The HKMA is the government authority in Hong Kong responsible for maintaining monetary and banking stability, including the maintenance and development of Hong Kong's financial infrastructure. The HKMA also performs its role as an overseer of the important clearing and settlement systems to promote the safety and efficiency of these systems under the CSSO which became effective on 4 November 2004. The CSSO also provides statutory backing to the finality of settlement for transactions made through systems designated under the CSSO by protecting the settlement finality from insolvency laws or any other laws.

The HKMA was established on 1 April 1993 by merging the Office of the Exchange Fund with the Office of the Commissioner of Banking. Its main functions and responsibilities are governed by the Exchange Fund Ordinance and the Banking Ordinance, and it reports to the Financial Secretary.

The HKMA plays an active role in the development of financial infrastructure in Hong Kong with a view to maintaining Hong Kong as an international financial centre and developing Hong Kong into a settlement hub in the Asian region.

### **1.2.1 Oversight**

The HKMA is the government authority in Hong Kong responsible for maintaining monetary and banking stability. Its main functions and policy objectives of the HKMA are<sup>1</sup>:

- maintaining currency stability within the framework of the Linked Exchange Rate System;
- promoting the stability and integrity of the financial system, including the banking system;
- helping to maintain Hong Kong's status as an international financial centre, including the maintenance and development of Hong Kong's financial infrastructure; and
- managing the Exchange Fund.

Unlike many other central banks, the HKMA does not carry out the following functions:

- Banknote Issue. The issue of \$20, \$50, \$100, \$500 and \$1000 notes is currently undertaken by three commercial banks. They are HSBC, the Standard Chartered Bank and the Bank of China (Hong Kong) Limited. The HKMA only issues \$10 notes on behalf of the government.

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<sup>1</sup> These functions and objectives are generally common to central banks around the world.

- Banker to the Government. Although the bulk of the fiscal reserves are held by the Exchange Fund, which is managed by the HKMA, the HKMA does not act as the banker to the Government, a function which has been carried out historically by commercial banks.

CSSO empowers the HKMA to designate and oversee clearing and settlement systems that are material to the monetary or financial stability of Hong Kong, or to the functioning of Hong Kong as an international financial centre. Currently six systems were designated under the CSSO, namely, the Central Moneymarkets Unit (CMU) (a clearing and settlement system for debt securities), HKD Clearing House Automated Transfer System (CHATS), USD CHATS, EUR CHATS, RMB CHATS (the RTGS systems), and the Continuous Linked Settlement (CLS) System. The first five are local designated systems. Except for the CLS System, the HKMA oversees the designated systems through off-site reviews, continuous monitoring, on-site examinations and meetings with management of the system operators and settlement institutions (SIs) of the systems.

As mentioned above, the HKMA encourages the retail payment industry to adopt a self-regulatory approach by issuing codes of practice to promote safety and efficiency. The HKMA is responsible for monitoring the compliance of Octopus Cards Limited (OCL) with the Code of Practice for Multi-purpose Stored Value Card Operation. OCL is required to submit to the HKMA an annual self-assessment report. The HKMA also monitors the compliance of the credit and debit card scheme operators in Hong Kong with the Code of Practice for Payment Card Scheme Operators. The card scheme operators are required to submit to the HKMA an annual self-assessment report and report to the HKMA any incident which may have material and adverse impact on cardholders in Hong Kong.

### **1.2.2 Provision of services**

All LBs in Hong Kong are required to maintain a settlement account with the HKMA. As stipulated in Section 3A(1) of the Exchange Fund Ordinance, the Financial Secretary may by notice in writing served on an AI require that institution to open a settlement account with the Monetary Authority for the account of the Exchange Fund. The account is required to be maintained and operated on the terms and conditions considered appropriate by the Financial Secretary. The Financial Secretary has delegated this power to the Monetary Authority. The Chief Executive of the HKMA can serve a Notice to all LBs requesting that they open a Settlement Account to be maintained and operated on the terms set out in the Conditions and the Operating Procedures attached to the Notice and the relevant provisions in the Clearing House Rules. In May 2000, the HKMA announced that Restricted Licence Banks (RLBs) in Hong Kong were also allowed to access the HKD CHATS, provided that they have demonstrated a business need to do so.

The operator of all RTGS systems in Hong Kong is Hong Kong Interbank Clearing Limited (HKICL), a company jointly owned by the HKMA and the Hong Kong Association of Banks (HKAB).

The CMU is a business unit of the HKMA specialising in the clearing and settlement of debt securities. The HKMA assumes no role in the settlement for equity securities (see Section 4).

### **1.2.3 Co-operative oversight arrangements**

For the CLS System, which is a designated system in Hong Kong but primarily regulated by its home supervisor, the US Federal Reserve, the HKMA participates in the international co-

operative oversight of the CLS System with the US Federal Reserve and other central banks through the CLS Oversight Committee.

SWIFT, a major global message carrier for payment systems, is subject to co-operative oversight by central banks, with the National Bank of Belgium being the lead overseer since the carrier is incorporated in Belgium. Since all the local designated systems have been migrated to the SWIFTNet platform in July 2010, the HKMA has an interest in the oversight of SWIFT and participates in discussions with the National Bank of Belgium and other central banks on relevant oversight matters.

The HKMA also co-operates with other central banks in the oversight of PVP links between payment and settlement systems in Hong Kong and those in other jurisdictions, including the USD/Indonesian Rupiah PVP link between the USD CHATS and Bank Indonesia's RTGS system and the USD/Malaysian Ringgit PVP link between the USD CHATS and the Malaysian RTGS system. The oversight of all interbank payment systems, including the CMU, is performed by the HKMA.

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

#### **1.3.1 Providers of payment services**

##### **1.3.1.1 Banks**

Hong Kong maintains a three-tier system of deposit-taking institutions, namely, LBs, restricted licence banks (RLBs) and DTCs. They are collectively known as AIs under the Banking Ordinance.

Under the Banking Ordinance, the HKMA is the authority responsible for the authorization, suspension and revocation of all three types of AIs. Checks and balances are provided in the Banking Ordinance with the requirement that the HKMA consults the Financial Secretary on important authorization decisions, such as suspension or revocation. The Chief Executive-in-Council is the appellate body for hearing appeals against decisions made by the HKMA.

Only LBs may operate current and savings accounts, accept deposits of any size and maturity from the public and pay or collect cheques drawn by or paid in by customers. LBs are required to open and maintain an account with the HKMA for the settlement of HKD. In other words, they have direct access to the HKD CHATS. Therefore LBs are the major providers of payment services in Hong Kong.

RLBs principally engage in merchant banking and capital market activities. They may take call, notice or time deposits of any maturity of HKD 500,000 and above. In May 2000, the legal arrangement was finalized to allow RLBs with a clear business need to open settlement accounts with the HKMA and to join the HKD CHATS for the settlement of HKD. However, they are not allowed to participate in the clearing of cheques given their restriction in extending current accounts to customers.

DTCs are mostly owned by, or otherwise associated with, banks. They engage in a range of specialised activities, including consumer finance and securities business. These companies may take deposits of HKD100,000 or above with an original term to maturity, or call or notice period, of at least three months. DTCs do not have direct access to the HKD CHATS.

Hong Kong has one of the highest concentrations of banking institutions in the world. Seventy of the 100 largest banks in the world have operations in Hong Kong. At the end of December

2010, there were 146 LBs, 21 RLBs and 26 DTCs. In addition, there were 67 local representative offices of overseas banks in Hong Kong. A local representative office is not allowed to engage in any banking business. Its role is confined mainly to liaison work between the bank and its customers in Hong Kong.

AIs have to comply with the provisions of the Banking Ordinance which, among other things, require them to maintain adequate liquidity and capital adequacy ratios, to submit periodic returns to the HKMA on required financial information, to adhere to limitations on loans to any one customer or to directors and employees, and to seek approval for the appointment of controllers, directors and senior management.

#### 1.3.1.2 Hong Kong Interbank Clearing Limited (HKICL)

HKICL is a private company jointly owned by the HKMA and HKAB, the latter being a private organization representing the banking industry that all banks in Hong Kong must join as members. HKICL was established in May 1995 to take over the HKD clearing functions provided by the former Management Bank of the Clearing House, HSBC in phases. The principle activity of HKICL is therefore the provision of interbank clearing and settlement services to banks in Hong Kong. In other words, HKICL is the system operator of the HKD CHATS.

HKICL is also the system operator for the foreign currency payment systems (including USD, EUR and RMB), and is responsible for the development and operation of these clearing systems in Hong Kong.

Apart from payment systems, HKICL also operates the computer system of the CMU, a central clearing and settlement system for public and private debt securities, on behalf of the HKMA.

#### 1.3.1.3 Hong Kong Securities Clearing Company Limited (HKSCC)

HKSCC was incorporated in May 1989. Pursuant to the Exchanges and Clearing Houses (Merger) Ordinance, HKSCC was converted from a company limited by guarantee to a company limited by shares and its constitution was amended accordingly. Following an allotment of shares prescribed by the Ordinance, HKSCC became a wholly owned subsidiary of the HKEx in 2000.

HKSCC created the Central Clearing and Settlement System (CCASS) in 1992, and became the central counterparty (CCP) which provides book-entry settlement in securities among its Participants, either free of, or against, payment.

Only securities listed or traded on the exchange are accepted as Eligible Securities for settlement in CCASS and only brokers, clearing agencies, custodians, stock lenders and stock pledgees based in Hong Kong and such other persons as HKSCC determine in accordance with the Rules will be accepted as Participants. HKSCC may from time to time accept other categories of securities, whether or not listed on the Exchange, as Eligible Securities and may admit other categories of participants. HKSCC also offers nominee service.

Building upon the capability of the RTGS systems in Hong Kong, the HKMA has extended the DVP facility for debt securities transactions to shares transactions. A link between HKICL and CCASS was set up in May 1998 to provide DVP facility for shares denominated in HKD in order to reduce settlement risks and improve settlement efficiency. Following the implementation of USD and RMB clearing systems in Hong Kong, the DVP facility was

extended to shares transactions denominated in USD in August 2000 and in RMB in October 2010 respectively.

#### 1.3.1.4 Central Moneymarkets Unit (CMU)

The CMU, established in 1990, is operated by the HKMA to provide computerised clearing and settlement facilities for Exchange Fund Bills and Notes (EFBNs). In December 1993, the HKMA extended the service to other HKD debt securities.

Since December 1994, the CMU has established a one-way link to such international central securities depositories (ICSDs) as Euroclear and Clearstream. This helps to promote Hong Kong's domestic debt securities to overseas investors who can make use of these links to participate in Hong Kong's debt market. The CMU also set up a network of bilateral linkages with the Central Securities Depositories (CSDs) in the Asia Pacific region, including Australia (December 1997), New Zealand (April 1998), South Korea (September 1999) and Mainland China (April 2004) to facilitate cross border clearing and settlement of debt securities in the region.

To provide a one-stop shop service to enable CMU Members to hold equity securities in their CMU accounts, CMU has become a custodian participant in the CCASS System operated by the HKSCC in June 2010. This provides additional convenience to CMU Members especially in handling equities derived from the conversion of convertibles lodged with CMU.

In December 1996, a seamless interface between the CMU and the HKD CHATS was established. This enabled the CMU to provide for its members real-time and end-of-day DVP services in HKD denominated securities. Through this interface, banks in the HKD CHATS are able to obtain HKD liquidity from the HKMA to facilitate payment flows through intraday and overnight repo of EFBNs.

Following the implementation of the foreign currency RTGS systems (i.e. the USD CHATS, EUR CHATS and RMB CHATS) in Hong Kong, the CMU system established a seamless interface with the USD, EUR and RMB RTGS systems in December 2000, April 2003 and February 2007 respectively. With these system interfaces in place, the CMU provides its members with real-time and end-of-day DVP settlement of USD, EUR and RMB denominated debt securities. Furthermore, these interfaces enable automatic intraday repo, which helps to provide intraday liquidity to the participants of these RTGS systems.

All debt instruments cleared through the CMU are either immobilised or dematerialised, and transfer of title is effected in computer book entry form.

Besides debt securities, CMU has extended its service to investment funds. Launched in August 2009, the CMU Fund Order Routing and Settlement Service provides CMU Members who are investment fund distributors, custodians, managers and institutional investors in Hong Kong and in the region a standardized platform for processing investment fund transactions. The service was designed to make fund order routing and settlement safer and more efficient by streamlining the processing of investment fund transactions among market participants.

### 1.3.2 Licensing and registration requirements for related securities service providers

Corporations carrying on regulated activities<sup>2</sup> must be licensed or registered under the Securities and Futures Ordinance (SFO). There are two types of legal entities which may be licensed by or registered with the SFC to carry on business in a regulated activity, namely:

- (a) A corporation licensed by the SFC for the regulated activity (i.e., a Licensed Corporation); and
- (b) A bank (or authorized financial institution) registered with the SFC for the regulated activity (i.e., a Registered Institution).

Applications by corporations for a licence or registration, or by individuals for a licence or for approval or consent to act as a Responsible Officer or an Executive Officer, must be refused unless the applicant satisfies the SFC or the HKMA that it/he is “fit and proper”.<sup>3</sup>

### 1.3.3 Other service providers

#### 1.3.3.1 Credit/charge card operators

VISA and MasterCard are the two largest credit card operators in Hong Kong. They provide the international network linkages through which the merchants, merchant acquirers and card-issuers are connected. China UnionPay (CUP) set up its credit card business in Hong Kong in 2004 and its operation has been growing since then. American Express and Diners Club International mainly operate in their charge card business on a stand-alone or vertical integration basis. That is, they perform the multiple roles of network provider, card issuer and merchant acquirer. JCB is issuing cards and acquiring merchants on its own. It also receives membership royalty fees from other institutions for the issuance of JCB International Co. Ltd (JCB) cards in Hong Kong.

#### 1.3.3.2 Other network operators

##### Electronic Payment Services Company (Hong Kong) Ltd (EPSCO)

EPSCO is the network provider of POS debit card services (Easy Pay System, or EPS), and it offers non-POS debit facilities including PPS<sup>4</sup> and bill payment services.

Founded in 1984, EPSCO is currently a consortium of 21 major banks in Hong Kong. The member banks do not issue separate cards for the payment services because the functions are typically included in the bank Automatic Teller Machine (ATM) cards and credit cards with ATM functions. EPSCO provides services to all merchant applicants on a uniform basis regardless of their size, location and business volume. It provides the terminals for free and

<sup>2</sup> There are 9 types of regulated activities listed in Schedule 5 to the SFO:

- Type 1: Dealing in securities
- Type 2: Dealing in futures contracts
- Type 3: Leveraged foreign exchange trading
- Type 4: Advising on securities
- Type 5: Advising on futures contracts
- Type 6: Advising on corporate finance
- Type 7: Providing automated trading services
- Type 8: Securities margin financing
- Type 9: Asset management

<sup>3</sup> Each Licensed Corporation or Registered Institution must have at least two individuals who are responsible for each regulated activity for which it is licensed or registered. These individuals are known as “Responsible Officers” for Licensed Corporations and “Executive Officers” for Registered Institutions.

<sup>4</sup> PPS is a phone and online bill payment solution provided by EPSCO and a telecom company.

does not impose a minimum service charge on the participating retailers. At present, EPS is accepted at over 25,000 locations in Hong Kong, Macau and Shenzhen.

#### Joint Electronic Teller Services Limited (JETCO)

JETCO was first established in 1982 by a small group of 5 banks, and nowadays JETCO has extended its services to over 30 member banks in Hong Kong and Macau. Its core business is to operate an interbank ATM network. Customers can access their accounts through JETCO's network of around 1,600 ATMs in Hong Kong. Besides ATM services, JETCO customers can make purchases through the POS terminals at designated retail outlets in Macau displaying the JETCO logo, with the purchase amount directly debited from the account selected. In addition, JETCO also provides electronic non-POS debit instruction services.

#### Octopus Card Limited (OCL)

OCL, formerly known as Creative Star Limited, issues the Octopus Card, which is a contactless MPC used primarily for the payment of transport services provided by the five transport operators that jointly own OCL (see Section 2.2.1.4. c)).

### **1.3.4 Role of other private and public sector bodies**

#### 1.3.4.1 The Hong Kong Association of Banks (HKAB)

The HKAB is a statutory body established in 1981 under the Hong Kong Association of Banks Ordinance to replace the Hong Kong Exchange Banks Association. All LBs are required to be members of the HKAB and to observe the rules set by the Association under the Ordinance.

The main objectives of the HKAB are to promote the interests of LBs, to draw up rules for the conduct of the business of banking, to act as an advisory body to its members in matters concerning the business of banking, and to provide facilities for the clearing of cheques and other instruments.

#### 1.3.4.2 DTC Association (DTCA)

Established in 1981 under the Companies Ordinance, the DTCA was originally known as the Hong Kong Association of RLBs and DTCs. Any RLB or DTC may join the DTCA.

The objectives of the DTCA include promoting the general interests of RLBs and DTCs, serving as an intermediary between its members and the government, and acting as a consultative body to the government on matters concerning deposits in Hong Kong.

## **2. Payment methods**

### **2.1 Cash payments**

Cash is still by far the most common means of retail payments in Hong Kong. At the end of 2009, HKD notes and coins in circulation amounted to HKD 208 billion, representing 12.8% of the GDP. Despite the significant growth of card-based or electronic means of retail payment in the past decade, cash usage in Hong Kong is still high.

Notes in everyday circulation in Hong Kong are in HKD10, HKD20, HKD50, HKD100, HKD500 and HKD1,000 denominations. The Government, through the HKMA, has authorized three commercial banks, HSBC, the Standard Chartered Bank (Hong Kong) Limited and the Bank of China (Hong Kong) Limited, to issue banknotes in Hong Kong. Authorization is accompanied by a set of terms and conditions agreed between the Government and the three note-issuing banks. The Government, also through the HKMA, issues notes denominated in HKD10. Banknotes issued by the three note-issuing banks and the Government HKD10 notes are issued, or redeemed, against payment to, or from, the Government's Exchange Fund in USD, at a specified rate of USD1 to HKD7.80 under the linked exchange rate system. The USD backing for issued notes is deposited with the Exchange Fund in exchange for Certificates of Indebtedness, which are redeemed by the Exchange Fund upon redemption of issued banknotes.

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

#### **2.2.1 Non-cash payment instruments**

##### **2.2.1.1 Credit transfers**

Most credit transfers are standing order arrangements made by the originators with their bank. The payer instructs his bank to debit his account and transfer the funds to the payee. 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 transfers.

Individual instructions are processed together with the bulk credit instructions for that day and the net obligations between banks are settled in the RTGS interbank payment system. The number of credit transfers processed by HKICL in 2010 was over 10 million for a total value of about HKD296 billion.

##### **2.2.1.2 Direct debits**

Standing direct debit instructions are commonly used by households for payment of such regular payments as utility bills and charges. In debit transfers, the payee instructs his bank to collect payment for 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.

Similar to direct credit transfers, individual debit instructions are processed in bulk clearing by HKICL for that day and the net obligations between banks are settled in the RTGS interbank payment system. The number of debit transfers processed by HKICL in 2010 was over 38 million for a total value of about HKD87 billion.

### 2.2.1.3 Cheques

Corporations or individuals in Hong Kong often use cheques as a means of payment or funds transfer. As a means for retail payment, they are also often used in transactions where debit cards or credit cards are not accepted (e.g. for payment of large value items such as motor cars or payment of deposit when purchasing property). Cheques are also used for some smaller value items such as payment of utility bills, but alternate electronic means of payment have become increasingly popular.

The cheque clearing system in Hong Kong is operated by HKICL and overseen by the HKMA. Interbank money settlement of cheques in net terms takes place between 14:15 and 14:45 on the business day following the deposit of a cheque. The cheque clearing system has an interface with the settlement accounts maintained by the banks with the HKMA. On average, about half a million cheques are cleared every day amounting to some HKD31 billion in 2010. This is about 4% of the daily amount handled by the HKD CHATS.

As from January 1998, it has been possible for HKD cheques issued by banks in Hong Kong to be presented at banks in the Shenzhen Special Economic Zone and delivered back to Hong Kong for clearing. Good funds can be made available to the payee in Shenzhen in the afternoon of the next business day after presentation of the cheque. A similar service was extended to 19 cities in Guangdong Province in October 2000. However the value of such cross-border cheques cleared is minuscule compared with the daily cheque processing volume in Hong Kong.

### 2.2.1.4 Payment cards

#### a) *Credit cards*

The use of credit cards has become increasingly popular in recent years. According to the HKMA's survey and quarterly statistics on major card operators, the total number of credit cards in circulation was 15.2 million and there were over 13 million credit card accounts involving more than HKD78 billion outstanding receivables in the third quarter of 2010. The credit cards used in Hong Kong include VISA, MasterCard, CUP, American Express, Diners and JCB.

Credit card payment involves credit provision by the card issuers to the cardholders. In a credit card transaction, the card issuer pays for the goods and services on behalf of the consumer, after charging the retailer a merchant discount fee. If a cardholder settles his account within the payment grace period offered by the card issuers (usually at least 30 days), the provision of credit is interest free. This buy-now-pay-later benefit is strikingly different from other means of retail payment, and explains why credit cards have become so popular in Hong Kong.

In 2008, VISA launched its Visa payWave card which is based on a contactless payment technology. Customers can make payment by holding their Visa payWave-enabled card at a close range from a contactless reader, thus speeding up transactions by removing the need to physically swipe or insert the card into a payment reader. In Hong Kong, cardholders can pay for transactions of up to HKD500 without having to resort to signature verification.

b) *Debit cards*

Debit cards in Hong Kong may be used in the EPS or JETCO platform. When a debit card is used in the EPS platform, EPS links up consumers and merchants via banks' electronic systems. Payments can be made with an ATM card at any outlet that displays the EPS logo. An EPS transaction involves direct transfer of funds from the bank account of the consumer to that of the retailer at the POS using bank ATM cards or credit cards with ATM function. It is in principle equivalent to payment by means of a credit transfer, except that the account of the payer is debited immediately at the POS but the account of the payee will only be credited by a batch run at day end or early next day.

c) *Other cards – multi-purpose stored value cards (MPCs)*

MPCs are at present one of the most popular modes of retail payment in Hong Kong after experiencing rapid growth in the past few years. Unlike credit cards and debit cards, the operation of MPC by definition involves prepayment of funds by the cardholders to the card issuers. The aggregate of the stored values constitutes the float, giving rise to the question of float management, which is of prudential concern to the HKMA and the public alike. This is one of the considerations that led to the authorization of OCL as a DTC (see below) to bring it under the regulatory regime of the HKMA.

Octopus Card is a contactless MPC issued by OCL. The card scheme was first launched in the third quarter of 1997, initially for transport usage.

In April 2000, OCL, formerly known as Creative Star Limited, was authorized as a special purpose DTC under the Banking Ordinance. The authorization of the company allows Octopus Card to be put to a wider range of uses, including non-transport-related, thus enhancing the convenience for cardholders. Its application now includes car parks, fast food outlets, bakeries, convenience stores, supermarkets, personal care stores, vending machines, photo booths, pay phones, photocopiers, cinemas and schools. Any extension of the multipurpose use of Octopus to non-transport service providers is subject to the conditions set down by the HKMA when it authorized the company as a DTC.

The number of Octopus Cards in circulation has reached over 20 million by the end of 2010, with over 11 million transactions on a daily basis. Octopus Card is also accepted at more than 20 outlets in Shenzhen of Mainland China. Payments made in these outlets are denominated in HKD.

### **2.2.2 Non-cash payment terminals**

Three electronic non-POS debit instruction services are available in Hong Kong, namely PPS, JET payment and ETC bill payment. Usage is mainly for payment of various bills and charges such as utility bills.

EPSCO operates PPS, which offers payment services over the phone and on the internet, and ETC bill payment, which is only available in the ETC ATMs (by using ETC ATM cards). On the other hand, JET Payment, a payment scheme operated by JETCO, is available in the JETCO ATMs (by using JETCO member banks' ATM cards) and on the internet. Consumers' prior registration is required for using PPS but not so for the other two payment schemes (JET Payment and ETC bill payment).

### **3. Payment systems**

#### **3.1 General overview**

Interbank fund transfers are made through payment systems that are essential components of the financial infrastructure. Hong Kong's interbank payment systems allow interbank transfers in the Hong Kong dollar, USD, EUR, and RMB. Banks can then extend money-transfer services to their customers. HKICL is the operator of the interbank payment systems, providing banks with various interbank clearing and settlement services. Links with payment systems and debt securities systems in other economies have been developed to provide an easily accessible payment and settlement platform for cross-border economic transactions and financial intermediation.

#### **3.2 Large-value payment systems**

##### **3.2.1 The Real Time Gross Settlement (RTGS) System for HKD**

The HKD RTGS system, which is known as HKD CHATS, was launched on 9 December, 1996.

###### **3.2.1.1 Institutional framework**

The HKD CHATS is deemed designated under the CSSO on 4 November 2004, and thus the settlement of transactions made through the system is final and irrevocable. Effective on the same date, the system was also granted a certificate of finality, in view of its compliance with the safety and efficiency requirements under section 7(1) of the CSSO. The certificate of finality provides statutory backing to the finality of settlement for transactions settled through the system. This finality is protected from insolvency laws and other laws by the CSSO.

The SI for the HKD CHATS is the HKMA through its Payment Systems Operation Division of the Financial Infrastructure Department (FID). The SI in turn appoints HKICL, which is jointly owned by the HKMA and HKAB, as the system operator (SO) of the HKD CHATS. The HKAB is the association of the banks in Hong Kong which represents the interests of the banking community.

###### **3.2.1.2 Participation**

All LBs in Hong Kong are required to maintain a settlement account with the HKMA. In May 2000, the HKMA announced that RLBs in Hong Kong were also allowed to access the HKD CHATS, provided that they have demonstrated a business need to do so. As at the end of 2010, there were 141 settlement accounts maintained with the HKMA.

All participating banks have direct access to the system under a single-tier structure of the HKD CHATS. All Settlement Account holders open and maintain HKD accounts with the HKMA and all interbank payments settled across the books of the HKMA are final and irrevocable with legal backing from CSSO.

### 3.2.1.3 Types of transactions handled

#### a) Large-value RTGS transactions

HKD CHATS transactions are settled real-time on a gross basis and are across the books of the HKMA. The payments are final and irrevocable upon funds transfer across the books of the HKMA.

#### b) Small-value bulk clearing items

In addition to settling large-value payments, CHATS also handles daily bulk clearings of stock market transactions, credit card transactions, cheques, small-value bulk electronic payment items (EPS, auto-credit and auto-debit transactions), and small-value ATM transfers. These items are cleared through HKICL on a bulk clearing and multilateral netting basis.

With the support of the HKMA, the HKAB commissioned HKICL to implement the Cheque Imaging and Truncation System (CITS) on an industry-wide basis. This new system began operating in June 2003. CITS has transformed the clearing process for cheques. Under CITS, small-value cheques are exchanged and cleared on the basis of an electronic presentation of cheque images and the relevant cheque data. This reduces the need for banks to physically deliver small-value cheques for clearing and settlement. Larger value cheques, and special items (such as suspicious cheques) regardless of their value, are still presented physically together with their images to the paying banks. With cheque imaging and truncation, the data and images taken from cheques are cheaper to handle and store and can be retrieved almost instantaneously from the image database through computer workstations.

### 3.2.1.4 Operation of the system

The system operator of the RTGS system is HKICL. The system is open from 08:30 to 18:30 (Hong Kong Time) every working day, Monday to Friday. During the above operating hours, banks can settle their interbank level transactions. For settlement of customer-related transactions, they have to be handled before 18:00.

### 3.2.1.5 Settlement procedures

Since May 2009, the HKD CHATS has been operating on SWIFTNet platform which helps enhance interoperability between domestic and international messages for payment instructions and remove operational barrier for overseas institutions to join the RTGS systems in Hong Kong. The participating banks send and receive payment messages to or from CHATS via SWIFTNet FIN Y-Copy service which enables the sender of a message to make a copy to a third party (the system operator) for authorization or further processing before forwarding it to the receiver.

Payment instructions are settled immediately if there is sufficient balance in the settlement account. Banks without sufficient balances in their settlement accounts have their payment instructions queued in the system. Alternatively, the banks can make use of the seamless interface between the Settlement Account Processor (SAP) and the debt securities clearing system (which is known as the CMU Processor or CMUP), to sell and repurchase their EFBNs during the day in the form of intraday repo transactions to obtain interest-free intraday liquidity from the HKMA.

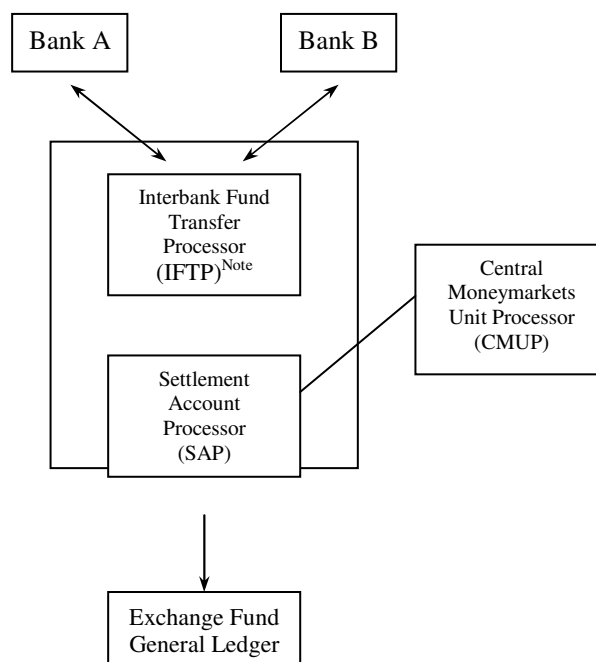
Diagram 1: Design of Hong Kong's RTGS system<sup>5</sup>**Diagram 1: Design of Hong Kong's RTGS system**

Diagram 1 depicts the basic system design of HKD CHATS. The system is composed of a SAP and an Interbank Fund Transfer Processor (IFTP). The IFTP is a computer system designed to real time process interbank fund transfer transactions. The SAP holds settlement accounts for all member banks. All interbank fund transfer transactions are processed by the IFTP and then routed to the SAP for posting and settlement. The linkage with the CMUP is to support intra-day and overnight repo transactions through which members can obtain intraday liquidity or overnight funding if needed.

All member banks are required to strictly adhere to the Rules as stipulated in the HKD Clearing House Rules. In addition, all participants of the HKD CHATS are required to comply with the terms and conditions in the account opening form and other documents as specified by the HKMA and HKICL.

The HKMA is the SI of the HKD CHATS and the system is operated by HKICL.

All RTGS transactions are settled real-time on a gross basis. When a payment has been settled across the books of the HKMA, it is regarded as final and irrevocable.

#### *Delivery versus Payment (DVP)*

With the establishment of the seamless interface between SAP and CMUP in December 1996, the HKD CHATS supports the real-time and end-of-day DVP facility for debt securities denominated in HKD that are lodged with the CMU. A similar seamless interface was also established with CCASS. Market participants can make use of such linkage to arrange both a

<sup>5</sup> IFTP is a real-time computer system designed to process interbank payment transactions electronically and provides administrative functions for HKICL to monitor, to maintain, as well as to control the IFTP.

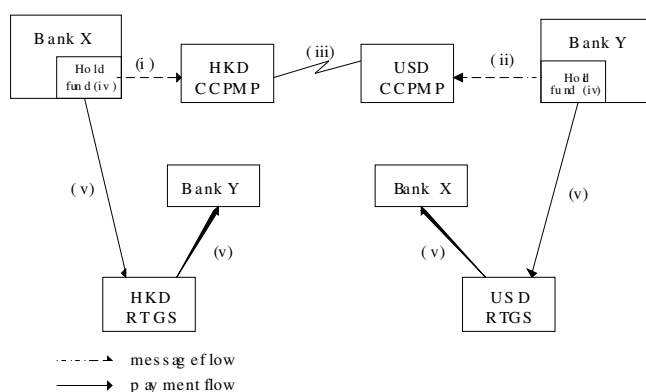
real-time and an end-of-day DVP facility for HKD-denominated shares which are listed on SEHK.

### *Payment versus Payment (PVP)*

The HKD CHATS is linked with the USD CHATS, EUR CHATS and RMB CHATS (See Section 3.2.2 for information on these foreign currency clearing systems in Hong Kong) for settlement of USD/HKD, EUR/HKD and RMB/HKD foreign exchange transactions respectively on a PVP basis. This PVP device (which is known as the Cross Currency Payment Matching Processor, or CCPMP) is the first known electronic foreign exchange PVP mechanism which ensures that both legs of these foreign exchange transactions are settled simultaneously which enables the elimination of Herstatt risk. With PVP settlement and the consequent elimination of Herstatt risk, the application of bilateral counterparty trading limits is no longer relevant, and interbank liquidity therefore improves as the traded currencies are put to immediate use in the respective clearing systems.

Diagram 2 depicts the PVP mechanism, using the HKD/USD PVP as an example. In this example Bank X is selling HKD to Bank Y in exchange for USD. On the settlement day, Bank X sends a PVP payment transaction to Bank Y in the HKD RTGS system (i). Bank Y also initiates a mirror PVP payment transaction in the USD RTGS system (ii). The CCPMP for HKD and the CCPMP for USD will then communicate with each other and attempt to match the transaction (iii). After successful matching, the HKD RTGS system and USD RTGS system will respectively hold the HKD funding of Bank X and the USD funding of Bank Y in their own settlement accounts (iv). If both Bank X and Bank Y have sufficient funds, the two RTGS systems will transfer the funds to their respective counterparty simultaneously (v).

**Diagram 2: Operation Flow of PVP Settlement**



### 3.2.1.6 Management of credit and liquidity risk

The HKMA has introduced a number of risk management measures to ensure smooth processing in the HKD CHATS.

a) Management of liquidity: It is noted that under the RTGS environment, the availability of intraday liquidity is a crucial element in order to reduce the chance of having payment gridlock in the system. In this regard, the HKD CHATS has built in various system features to facilitate liquidity management for banks. Banks are able to view the balance in their settlement accounts on a real time basis. They also have access to the net amounts they need to pay (or receive) for each of the bulk clearing runs that take place during the day so that they can arrange funding in advance for settlement purpose if necessary.

b) Repo facility: Banks can arrange with the HKMA to obtain liquidity through repo facility. Within the day before intraday repo cut-off time, if a bank does not have sufficient balance in its settlement account to effect an outgoing payment but has sufficient EFBNs in its intraday repo account, the system can automatically trigger (or the bank can manually trigger) an intraday repo transaction to generate the required amount of credit balance to cover the shortfall. A bank can repurchase the repo transaction at any time before system close. Intraday repos that cannot be repurchased before system close will be automatically rolled into overnight borrowing under the Discount Window in which interest is charged by the HKMA. Apart from this, banks can also arrange overnight repos with the HKMA manually through the Discount Window facility if required.

c) Queuing mechanism: The system design of the HKD CHATS allows a participant to manage the sequencing of payments. If a bank does not have sufficient balance in its settlement account to effect a payment, the transaction is queued in the system. Banks can make use of a re-sequencing function to move the selected transaction up or down their list of queued payments. The queuing mechanism allows the banks to manage their own queues of payment instructions through cancellation and re-sequencing.

d) Monitoring: To ensure the smooth processing of the payment system, the HKMA closely monitors the payment condition of each bank on a real-time basis.

e) Throughput guidelines: In December 1996, the HKMA issued a guideline to banks on their CHATS throughput in order to encourage banks to make payments in a timely and an orderly manner throughout the day. The throughput guideline has been revised as the operating window of the HKD CHATS was extended by phases during 2007 and 2008. Each bank is now required to release and settle their interbank payments which are not less than 35% by 13:30, and 70% by 16:30 of the value of its total RTGS payments for the day. The HKMA closely monitors banks' compliance with throughput targets and discusses with individual banks if they consistently under-perform.

f) No overdraft: Settlement Account holders are not required to maintain a minimum amount or reserve in their settlement accounts with the HKMA. Nonetheless, the settlement accounts are not allowed to go into overdraft.

g) Confidentiality: While a bank inputs the full details of its payment instructions, including customer information, to IFTP, the instruction will be stripped so that only the settlement instruction (i.e. information on the amount, the paying bank and the receiving bank) of the payment instruction will be passed onto the SAP.

h) Liquidity Optimisers: There are two major types of optimisers introduced to the HKD CHATS which help increase liquidity efficiency. The first type of optimisers is RTGS Liquidity Optimiser (RLO) which is a liquidity-saving device introduced in January 2006 to improve liquidity efficiency through periodic multilateral offsetting of payment instructions queued in the HKD CHATS at some time interval. Apart from scheduled RLO runs, runs can also be triggered by the HKMA if necessary. The second type of optimisers helps improve liquidity efficiency by netting bulk settlement payments in a bulk settlement run. These include CHATS Optimiser introduced in June 2004 (which is settled with paper cheques and other clearing items in the 14:15 settlement run simultaneously), Cross Currency CHATS Optimiser introduced in October 2006 (which combines the CHATS Optimiser with the PVP mechanism) and CCASS Optimiser introduced in January 2008 (which is settled with CCASS transactions simultaneously).

### 3.2.1.7 Pricing

All expenses incurred by HKICL in providing, managing and operating the clearing house and the clearing facilities are borne by HKICL, which in turn recovers the expenses through charging the banks fees for use of the clearing facilities on a cost recovery basis. A tiered pricing structure in which frequent users will be charged less on an average basis is adopted.

### 3.2.1.8 Migration to SWIFTNet platform

The SWIFTNet migration project, which replaced the proprietary platform of the RTGS systems and CMU in Hong Kong with an open SWIFTNet platform and improved the real-time interactive user interfaces, was completed after the successful launch of Phase 2 of the project in July 2010. The migration has enhanced interoperability between domestic and international messages for payment instructions and removed operational barrier for overseas institutions to join the RTGS systems in Hong Kong, thus reinforcing Hong Kong's status as an international financial centre.

## 3.2.2 The Real Time Gross Settlement (RTGS) System for USD, EUR and RMB

There are three foreign currency RTGS systems in Hong Kong, which include the USD, EUR and RMB RTGS systems.

### 3.2.2.1 Institutional framework

The USD RTGS system in Hong Kong (known as USD CHATS) was launched in August 2000 while the EUR RTGS system in Hong Kong (known as EUR CHATS) was launched in April 2003. The purpose of the USD and EUR CHATS is to provide efficient settlement of USD and EUR transactions during Asian business hours. Given Hong Kong's role as an international financial centre, and the fact that the USD and EUR are two of the most important global currencies nowadays, there is a business case for introducing improved mechanisms for settling USD and EUR payments in Hong Kong. The SIs of the USD and EUR CHATS are commercial banks and were appointed by the HKMA after going through a vigorous selection process with franchise renewal every five years afterwards.

The RMB RTGS system in Hong Kong (known as RMB CHATS) was launched in June 2007 which was upgraded from the Renminbi Settlement System established in March 2006, to cater for the settlement needs arising from expanded RMB business in Hong Kong. The clearing bank (CB) of the RMB CHATS, which is a commercial bank appointed by the People's Bank of China, maintains a settlement account with the People's Bank of China. It is also a member of China's National Advanced Payment System (CNAPS), the real-time gross settlement system in China.

In terms of system design, the USD CHATS, EUR CHATS and RMB CHATS are almost exact replicas of the HKD CHATS, except the following characteristics:

- The SIs/CB for the foreign currency RTGS systems are commercial banks. In this regard, each direct participant has to open and maintain a settlement account with the SIs/CB and all transactions will be settled across the books of the SIs/CB.
- The USD and EUR CHATS adopt a two-tier membership structure in which banks can join the system as either direct participants or indirect participants. The system also accepts overseas members as long as they are approved to join the system by the HKMA and the SI.

- Unlike the HKD CHATS, the USD SI and EUR SI provide a clean intra-day overdraft facility to the direct participants in the system to facilitate their liquidity management.

### 3.2.2.2 Participation

Participation in the USD CHATS, EUR CHATS and RMB CHATS is not mandatory. At the end of 2010, the number of participants of the USD, EUR and RMB CHATS was 224, 50 and 96 respectively. Most of the participants are banks.

### 3.2.2.3 Types of transactions handled

#### a) *Large-value RTGS transactions*

All USD, EUR and RMB CHATS transactions are settled real-time on a gross basis and are across the books of the respective SI/CB. The payments are final and irrevocable upon funds transfer across the books of the respective SI/CB.

#### b) *Small-value bulk clearing items*

The USD CHATS and RMB CHATS have fewer bulk clearing and settlement items compared with the HKD CHATS while there is currently no bulk clearing and settlement items for the EUR CHATS. Bulk clearing and settlement items available in the USD CHATS currently include paper cheque, credit card and stock-related items. To cater for the recent expansion of the scope of RMB business in Hong Kong, there have been a series of enhancements to the RMB CHATS to create bulk clearing and settlement items related to autopay and stock transactions on top of the existing paper cheques. The mechanics for the clearing and settlement process for these items are similar to those for the HKD CHATS.

### 3.2.2.4 Operation of the System

The operator of the USD CHATS, EUR CHATS and RMB CHATS is HKICL. The system is open from 08:30 to 18:30 every working week, Monday to Friday. During the above operating hours, banks can settle their interbank transactions. Customer-related transactions have to be handled before 18:00. Since November 2009, the USD CHATS, EUR CHATS and RMB CHATS have been operating on all Hong Kong general holidays, except 1 January which is a worldwide holiday. It facilitates local and overseas institutions' use of our RTGS systems to process their regional payments and helps reinforce Hong Kong's role as a payment and settlement hub in the region.

### 3.2.2.5 Settlement procedures

The SIs of the USD CHATS and EUR CHATS are HSBC and Standard Chartered Bank (Hong Kong) Limited respectively while the CB of the RMB CHATS is Bank of China (Hong Kong) Limited.

#### a) *RTGS*

All RTGS transactions are settled real-time on a gross basis. When a payment is settled across the books of the SI/CB, it is regarded as final and irrevocable.

#### b) *Bulk settlement*

Bulk settlement is designed to handle small value bulk clearing items. All bulk clearing items are settled on a multilateral netting basis and on the next business day. They are settled after

any returned items have been identified and adjusted in order to eliminate the settlement risk arising from returned items.

c) *Delivery versus Payment (DVP)*

The USD CHATS, EUR CHATS, RMB CHATS are linked up with the CMUP (i.e. the debt securities clearing system operated by the HKMA) to support real-time and end-of-day DVP facility for debt securities denominated in USD, EUR and RMB respectively that are lodged with the CMU. A similar seamless interface has been established with CCASS for the USD CHATS and RMB CHATS. Market participants can make use of such a linkage to arrange both real-time and end-of-day DVP facility for USD- and RMB-denominated shares which are traded on SEHK.

d) *Payment versus Payment (PVP)*

The HKD, USD, EUR and RMB CHATS have been linked up with each other for settlement of USD/HKD, EUR/USD, USD/RMB, EUR/HKD, EUR/RMB, RMB/HKD foreign exchange transactions on a PVP basis. This PVP device, which is known as the CCPMP, ensures that both legs of the foreign exchange transaction are settled simultaneously to eliminate the Herstatt risk.

The USD CHATS has also established PVP links with Malaysia's ringgit RTGS system and Indonesia's rupiah RTGS system respectively so that the settlement efficiency of the USD and Malaysian ringgit pair and the USD and Indonesian rupiah pair in the region has been improved and Herstatt risk has been reduced.

### 3.2.2.6 Management of credit and liquidity risk

Various risk management measures are instituted:

a) Management of liquidity: Similar to the HKD CHATS, the USD CHATS, EUR CHATS and RMB CHATS have built in various system features to facilitate liquidity management for the participating banks. Banks are able to enquire the balance in their settlement accounts on a real-time basis. In addition, they also have access to the net amounts they will need to pay (or receive) for each of the bulk clearing runs that take place during the day.

b) Intraday overdraft: In contrast to the HKD CHATS, the direct participants of the USD CHATS and EUR CHATS may go into overdraft by making use of the interest-free intra-day overdraft facility provided by the USD SI and EUR SI respectively. When a direct participant does not have sufficient credit balance to effect their payment instructions, the bank can make use of the overdraft provided to effect their payments to their counterparties.

c) Repo facility: Similar to the HKD CHATS, participating banks of the USD CHATS and EUR CHATS can obtain liquidity through repo facility. Within the day, if a bank does not have sufficient balance in its settlement account to effect an outgoing payment but has sufficient EFBNs in its intraday repo account, the system can automatically trigger (or the bank can manually trigger) an intraday repo transaction to generate the required amount of credit balance to cover the shortfall. A bank can repurchase the repo transaction at any time before system close. Intraday repos that cannot be repurchased before system close will be rolled into overnight borrowing in which interest is charged by the SI. A similar intraday-day repo facility for the RMB CHATS will be launched in early 2011.

d) Queuing mechanism: Similar to the HKD CHATS, if a bank does not have sufficient balance in its settlement account to effect the payments in the USD, EUR and RMB CHATS, the transactions will be queued in the system. The bank can make use of the re-sequencing function to move the selected transaction up or down their list of queued payments. The queuing mechanism allows the banks to manage their own queues of payment instructions through cancellation and resequencing.

e) Monitoring: The SI/CB closely monitors the payment condition of each direct participant on a real-time basis. Through the SAP, the SI/CB and the HKMA can access the position of each bank as well as each transaction details (up to bank level only). The HKMA also closely oversees the performance of the SI/CB. The HKMA meets regularly with the SI/CB to discuss on issues which are of mutual interest and beneficial to the users in the foreign currency clearing systems.

f) Throughput guidelines: Similar to the HKD CHATS, the banks of the USD CHATS and EUR CHATS are required to comply with the CHATS throughput guideline in which each direct participant is required to release and settle interbank payments which are not less than 35% by 13:30 and 70% by 16:30 of the value of its total CHATS payments for the day.

g) Confidentiality: Similar to the HKD CHATS, only the settlement instruction (i.e. information on the amount, the paying bank and the receiving bank) of the payment instruction will be passed onto the foreign currency SAP.

h) Liquidity Optimisers: Similar to the HKD CHATS, RLO was introduced to the foreign currency CHATS to improve liquidity efficiency. CHATS Optimiser, CCASS Optimiser and Cross Currency CHATS Optimiser will be introduced to the RMB CHATS shortly to cater for the recent expansion of the scope of RMB business in Hong Kong.

#### 3.2.2.7 Pricing

The USD CHATS, EUR CHATS and RMB CHATS adopt a tiered pricing structure in which frequent users will be charged less on an average basis. The fees to be charged by HKICL require the approval from the respective SI/CB and the HKMA.

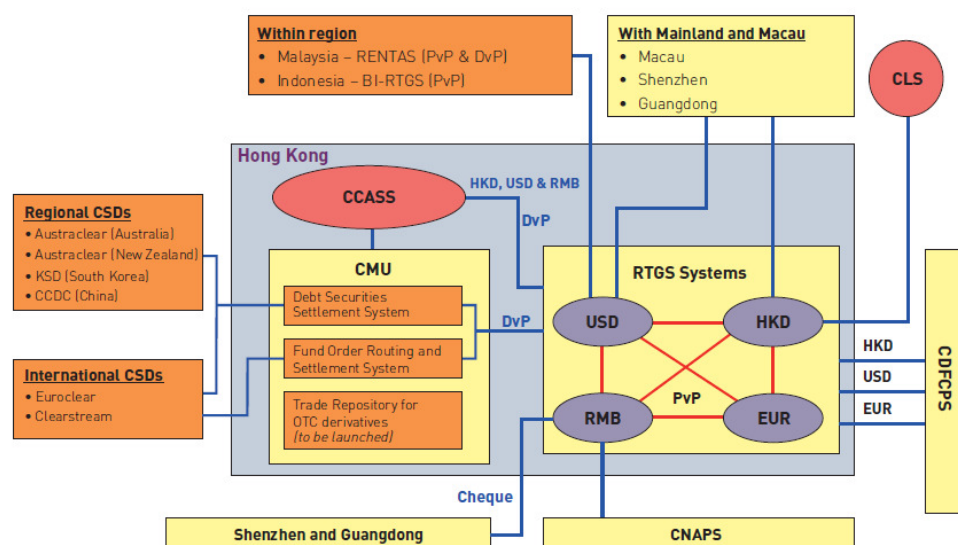
#### 3.2.2.8 Enhancements to the RMB CHATS

To capture the new business opportunities that may arise from the significant expansion in the scope of RMB business in Hong Kong, especially under the revised Settlement Agreement on the Clearing of Renminbi Businesses between People's Bank of China and the CB of the RMB RTGS system (the revised Clearing Agreement) effective from July 2010, a new liquidity saving device, RLO and a new DVP function for supporting listing of RMB-denominated securities on SEHK were added to the RMB CHATS. The functionalities of the RMB CHATS will be brought in line with those of the HKD CHATS gradually to ensure system readiness for supporting full range of financial activities.

### 3.3 Payment Links

Over the years, the HKMA has been devoting much effort and resources to building a robust and efficient multi-currency, multi-dimensional platform, with extensive domestic and overseas system linkages as shown in Diagram 3 below. Apart from the three foreign currency RTGS systems and the local currency RTGS system, Hong Kong has also established various payment links with other central banks in the Asia region and also the Mainland.

Diagram 3: Hong Kong's Multicurrency Payment and Settlement Infrastructure



BI-RTGS – Bank Indonesia Real Time Gross Settlement (Indonesia's rupiah RTGS system)  
 CCASS – Central Clearing and Settlement System (settlement system for shares)  
 CCDC – China Central Depository & Clearing Co., Ltd.  
 CDFPCS – China's Domestic Foreign Currency Payment System  
 CLS – Continuous Linked Settlement  
 CMU – Central Moneymarkets Unit (settlement system for debt securities)  
 CNAPS – China National Advanced Payment System  
 KSD – Korean Securities Depository  
 RENTAS – Real Time Electronic Transfer of Funds and Securities (Malaysia's ringgit RTGS system)

DvP – Delivery-versus-Payment  
 Pvp – Payment-versus-Payment

### 3.3.1 Cross-border PVP links

The first cross-border PVP link was established between Hong Kong's USD CHATS and Malaysia's ringgit RTGS systems in November 2006 while the second PVP link was set up between Hong Kong's USD CHATS and Indonesia's rupiah RTGS systems in January 2010. As mentioned earlier, PVP greatly improves settlement efficiency and eliminates settlement risk arising from time lags in settlements and from time-zone differences. These PVP links also enhance Hong Kong's status as the regional payment and settlement hub.

### 3.3.2 Payment links with the Mainland

The HKMA has been working closely with Mainland authorities in providing efficient cross-border payment links to meet the growing demand. The HKMA has established both HKD and USD CHATS links with Shenzhen and Guangdong which allow cross-border payments in HKD and USD between banks in Hong Kong and their counterparts in Shenzhen and Guangdong to be settled efficiently and safely.

Hong Kong has also established two-way HKD joint cheque-clearing with Guangdong and Shenzhen, two-way USD joint cheque-clearing with Shenzhen, and one-way RMB joint cheque-clearing with Guangdong and Shenzhen. The two-way joint cheque-clearing facilities shorten the clearing time for cheques drawn on banks in Hong Kong and presented in Shenzhen and Guangdong, and for cheques drawn on banks in Shenzhen and Guangdong and presented in Hong Kong. The one-way RMB joint cheque-clearing only covers RMB cheques drawn on banks in Hong Kong and presented in Shenzhen and Guangdong at the moment.

The RTGS cross-border links with the Mainland's Domestic Foreign Currency Payment Systems were launched in March 2009. The multi-currency cross-border payment arrangements settle HKD, USD, EUR and British pound payments between the Mainland's

Domestic Foreign Currency Payment Systems and the HKD, USD and EUR CHATS in Hong Kong. Settlements for transactions denominated in the British pound are through a correspondent bank in Hong Kong. These arrangements enable Mainland and Hong Kong banks to manage their liquidity more efficiently and become more competitive in providing cross-border payment services in the Asian time zone, thus reducing settlement risk. While the operating mechanism is similar to that of the HKD and USD RTGS links with Shenzhen and Guangdong, the geographical coverage has been expanded considerably to benefit more Mainland cities.

### **3.3.3 Payment Links with Macau**

The one-way joint clearing facility for HKD cheques between Hong Kong and Macau was launched in August 2007 and a similar facility for USD cheques was launched in June 2008 to meet growing demands. The facilities reduce the time required for clearing HKD and USD cheques issued by banks in Hong Kong and presented in Macau from four or five days to two.

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

### **4.1 General overview**

Securities traded in Hong Kong are cleared and settled through two distinctive securities settlement systems, namely the CMU operated by the HKMA for the clearing and settlement of government-issued and private-sector debt securities, and the CCASS operated by the HKSCC for the clearing and settlement of equity securities traded on the SEHK. Both the CMU and the CCASS act as CSDs. While the CMU is not a CCP, CCASS is a CCP securities settlement system.

### **4.2 Post-trade processing systems**

#### **4.2.1 Trade repository (TR)**

In responses to the G20's commitments to accelerate the implementation of over-the-counter (OTC) derivatives regulation and supervision and to increase transparency and standardization in the OTC derivatives markets, the HKMA will develop a local TR by end-2012. Initially, the TR will cover a number of standardized OTC derivatives asset classes. A linkage will be developed between the TR and the CCP clearing facility for OTC derivatives to be launched by the Hong Kong Stock Exchange to allow eligible transactions to be passed to the CCP for central clearing. The HKMA will work in concert with other regulatory authorities to develop a regulatory framework for TR reporting.

### **4.3 Central counterparties and clearing systems**

As mentioned above, CCASS is a CCP securities settlement system. Please refer to sections 4.4.2.4 for the CCP functions of CCASS).

### **4.4 Securities Settlement Systems**

Securities traded in Hong Kong consist mainly of EFBNs, private debt securities, and equity securities. These transactions are cleared and settled through two different securities settlement systems:

- The CMU operated by the HKMA, which clears and settles EFBNs, bonds issued by the Government of the Hong Kong Special Administrative Region, and debt securities issued by both public and private sector entities.
- CCASS operated by the HKSCC, which clears and settles equities securities traded on the Stock Exchange of Hong Kong (SEHK).

Both the CMU and the CCASS also acts as CSDs (see sections 4.4.1.6 and 4.4.2.6 for a brief overview).

#### **4.4.1 Central Moneymarkets Unit (CMU)**

##### **4.4.1.1 Types of assets and products cleared and settled by CMU**

Securities products cleared and settled by CMU include the EFBNs, bonds issued by the Government of the Hong Kong Special Administrative Region, and debt securities issued by both public and private sector entities.

#### 4.4.1.2 Institutional framework for CMU

The CSSO of the Hong Kong laws established a statutory regime for the Monetary Authority to designate and oversee clearing and settlement systems which are material to the monetary or financial stability of Hong Kong or to the functioning of Hong Kong as an international financial centre. The CSSO also provides statutory backing to the settlement finality of those transactions effected through such designated systems by protecting the settlement finality from insolvency laws or any other laws. Effective from 4 November 2004, the CMU is deemed to have been designated under the CSSO and all transactions effected through the CMU since then will enjoy statutory backing to their settlement finality.

#### 4.4.1.3 Participation in CMU

There are two types of membership:

a) **Recognised Dealers (RDs) and Market Makers (MMs):** In Hong Kong, a two-tier dealership scheme was set up when the EFBN Programmes were implemented. A number of RDs and MMs in EFBNs were appointed by the HKMA. In return for certain privileges, the RDs and MMs are obliged to support, with different degree of commitments, the development of the EFBN market. RDs are to participate in the secondary market and to promote EFBNs in retail market. MMs, appointed from the pool of RDs, are to participate actively in the primary market and have the added responsibility of maintaining secondary market liquidity. Only the RDs and MMs are eligible to settle EFBNs through the CMU. The Government Bond Programme (GBP) which was set up in 2009 also adopted the two-tier dealership scheme. A number of RDs and Primary Dealers (PDs) were also appointed by the HKMA. Similarly, RDs of GBP are to participate in the secondary market while some RDs are additionally appointed to be PDs to participate actively in the primary market.

b) **CMU Members:** Those who can fulfil the following membership criteria can join the CMU as CMU Member to settle and clear private sector debt securities:

- AIs in Hong Kong and
- Members of the Asia Capital Markets Association.

At the end of December 2010, there were 156 CMU Members and 143 RDs/MMs/PDs. The rights and obligations of RDs/MMs/PDs and CMU Members using the CMU service are set out in the “Appointment Letter of Recognised Dealer/Market Make/Primary Dealer” and “CMU Membership Agreement” respectively.

CMU Participants are required to maintain separate accounts for their own holdings and clients’ holdings. A client with substantial holdings may request the CMU Member to open a specific custody account under his name.

#### 4.4.1.4 Overall explanation of the settlement process of CMU

##### a) *Pre-settlement trade matching and confirmation*

The CMU provides two types of trade matching services for its participants.

For real-time DVP, both the seller and the buyer input instructions through its CMT or SWIFT. Once the instruction is matched, the ‘matched’ transaction will be stored in the system. When the funds and securities are sufficient, real-time settlement takes place immediately. The securities accounts and settlement accounts of the buyer and the seller are debited and credited

accordingly. If the seller does not have sufficient securities, the system will retry at every 15 minutes' interval until the cut-off time by which all unsettled transactions are converted to end-of-day transactions and settled during the end-of-day settlement run. If the buyer does not have sufficient funds in its cash accounts, the transactions are pending for settlement until sufficient funds are available in the buyer's accounts. If the transactions cannot be settled before the cutoff time, the transactions are converted to end-of-day transactions and settled during the end-of-day settlement run.

For end-of-day transactions, securities and cash are settled on a multilateral netting basis. At the settlement time of end-of-day settlement run, the CMU calculates the net settlement amount of both securities and cash for each member. CMU will then check whether sufficient funds and securities are available for each member. If so, final transfers of both securities and cash for all members are effected simultaneously. Otherwise, all or part of transfer instructions of the members who do not have sufficient funds or securities will be cancelled before final end-of-day settlement takes place.

#### *b) Settlement*

All debt instruments cleared through the CMU are either immobilised or dematerialized, and transfer of title is effected in computer book entry form.

The CMU service offers two types of settlement mode: 1) DVP and 2) Free of Payment (FOP). Through the seamless interface with the HKD, USD, EUR and RMB RTGS systems, the CMU provides real time DVP settlement for its members. Members, who are direct participants of the HKD, USD, EUR or RMB RTGS systems, can settle the transaction directly through their cash clearing account with the SIs/CB of the respective RTGS systems. For those not participating in the RTGS system as direct participants, they have to appoint a settlement bank to effect their payment arising from the securities transactions.

For real time settlement, it is settled on a gross basis. The real time window opens at 8:30 till 16:00. Unsettled transactions are automatically converted into end-of-day transactions, which are settled on a multilateral netting basis. The end-of-day settlement run starts at 16:05 and completes before 17:00.

For OTC trades, the settlement cycle could be as short as T+0, subject to the arrangement between the trading parties. For exchange traded transactions, the settlement cycle is T+2.

#### 4.4.1.5 Arrangements for money settlement in CMU

As mentioned in 4.4.1.4, payments for transactions are done through the interbank payment systems in HKD, USD, EUR or RMB either on a real-time basis (RTGS) or through a batch of direct debit and credit transactions generated by the system at the end-of-day settlement run.

For those not participating in the interbank payment system as direct participants, they have to appoint settlement banks to effect their payments arising from the securities transactions.

#### 4.4.1.6 CMU as a Central Securities Depository (CSD)

The CMU acts as the CSD for Hong Kong domestic debt securities and provides members the following core facilities:

- a front-end system that allows users to transmit transfer instructions, make enquiries, and request reports;

- a safe custody service for EFBNs, Government Bonds and private sector debt securities;
- a collateral management system;
- a securities lending and borrowing programme;
- a bilateral linkage system with the ICSDs such as Euroclear and Clearstream and CSDs in the region such as Austraclear in Australia, NZClear in New Zealand and Korea Securities Depository in Korea;
- a tender allocation process that automates the processing of tendering;
- interest payments and redemption processing through a link with the RTGS payment systems; and
- income distribution services.

#### 4.4.1.7 Risk management of CMU

The CMU is not a CCP of securities transactions and does not guarantee settlement. Settlement of transactions will fail if either buyers have insufficient funds or sellers have insufficient securities. These failed transactions will be automatically cancelled from the system when the CMU system closes.

Besides, the CMU does not grant any credit facilities to its members for the purpose of settling the securities transactions. For bank members, they can obtain the necessary intraday liquidity through automatic intraday repo transactions entered with the SIs of the payment systems. Therefore, the CMU is not exposed to any credit risk to its members.

The CMU system also does not create credit exposure between CMU Members arising from settling securities transactions through the CMU because the CMU provides both real-time and end-of-day DVP facilities to its members. However, since the settlement is not guaranteed, a CMU Member may bear the replacement cost if a securities transaction fails to settle. This replacement risk can be reduced by settling the transactions on a real-time DVP basis.

With regards to the disaster arrangement, the CMU has a hot backup site that is located outside the central business district. Production data is copied to the site on a real-time basis. When a major operational disruption happens prohibiting operations at the production computer centre, the hot backup site can be activated within half an hour. There is also a detailed contingency plan that covers the processing activities relating to clearing and data processing using the remote site. The contingency plan addresses a major operational failure at the production site and a failure of a participant's CMU User Terminal (CMT).

The CMU maintains a comprehensive system of internal controls and procedures. This aims to minimize the operational risk. These internal controls and procedures are subject to examination of both internal and external auditors. The internal audit is conducted on a continuous basis while the external audit is conducted annually.

The Audit Commission is the external auditor of the accounts of the Government. The objective of the Audit Commission is to provide independent, professional and quality audit services to the Legislative Council and public sector organizations in order to ensure the efficient and effective use of public resources and to enhance public sector accountability in Hong Kong.

The internal auditor of the HKMA is set up with the primary objective to assist the management of the HKMA in the effective discharge of its responsibilities and functions. This is achieved through comprehensive audit coverage sufficient to assure that assets and resources of the HKMA are appropriately safeguarded and accounted for, and that established procedures and guidelines are adhered to. The internal auditor assesses and reports on the effectiveness of the financial and accounting systems as well as the management reporting system.

#### **4.4.2 CCASS**

##### **4.4.2.1 Types of assets and products cleared and settled by CCASS**

Securities products cleared and settled by CCASS include equity securities (ordinary shares and preference shares), depositary receipts, equity warrants, debt securities, unit trusts and mutual funds (including Exchange Traded Funds (ETFs) and Real Estate Investment Funds (REITs)) and structured products (including derivative warrants, Callable Bull/Bear Contracts and Listed Equity Linked Instruments).

##### **4.4.2.2 Institutional framework for CCASS**

The operation of CCASS by HKSCC is under the oversight of the SFC, which is an independent statutory body in Hong Kong under the SFO. HKSCC is required under the SFO to ensure (i) so far as reasonably practicable, that there are orderly, fair and expeditious clearing and settlement arrangements for any transactions in securities or futures contracts cleared or settled through CCASS; and (ii) that risks associated with the business and operations of CCASS are managed prudently.

##### **4.4.2.3 Participation in CCASS**

There are seven types of CCASS participants, including:

1. Direct Clearing Participants – they must be exchange participants of the Stock Exchange of Hong Kong (SEHK) and licensed corporations which are licensed to carry out dealing in securities under the SFO.
2. General Clearing Participants – they must be licensed corporations which are licensed to carry out dealing in securities under the SFO or registered institutions which are registered to carry out securities dealing under the SFO.
3. Custodian Participants – they must be AIs under the Banking Ordinance, or trust companies registered under the Trustee Ordinance, or licensed corporations which are licensed to carry out dealing in securities under the SFO but not exchange participants of SEHK, or be the Monetary Authority under the Exchange Fund Ordinance.
4. Investor Participants – for Individual Investor Participants, they must be individuals aged 18 or above, holding Hong Kong identity cards or Macau Resident identity cards and not undischarged bankrupt or be subject to any legal incapacity; for Joint Individual Investor Participants, they must be individuals aged 18 or above, holding Hong Kong identity cards and not undischarged bankrupt or be subject to any legal incapacity; for Corporate Investor Participants, they must be incorporated under the Hong Kong Companies Ordinance or legal entities established under any other ordinance of Hong Kong or established under the laws of any other jurisdiction outside Hong Kong that is approved from time to time by HKSCC for investor participation purposes.

5. Stock Lender Participants – they must have established stock lending business in Hong Kong in securities listed on SEHK or that they have the financial and operational capacity to establish and operate a stock lending business in Hong Kong and have available a sufficient quantity of securities listed on SEHK for lending.

6. Stock Pledgee Participants – they must be AIs under the Banking Ordinance or licensed money lenders under the Money Lenders Ordinance and have established business in Hong Kong of lending money against the security of securities listed on SEHK, or otherwise have the financial and operational capacity to establish and operate such a business in Hong Kong.

7. Clearing Agency Participants – they must be bodies recognised and regulated in Hong Kong by the SFC or other similar regulatory organisation or, in an overseas jurisdiction, by a governmental body or securities regulatory agency or an equivalent authority in respect of its business in operating a central securities clearing and settlement system and/or a CSD system or similar systems.

All exchange participants of SEHK must become CCASS clearing participants or have made arrangement with General Clearing Participants to clear on their behalves by virtue of the rules of SEHK.

#### 4.4.2.4 Overall explanation of clearing and settlement process of CCASS

CCASS determines the stock and money obligations of participants to a securities transaction to deliver or receive either cash or securities for the purpose of clearing. CCASS also provides settlement services under which securities are credited or debited to participants' CCASS stock accounts and funds are recorded in the participants' money ledgers on settlement day.

Details of all exchange trades (i.e. trades of eligible securities executed on SEHK), including trade data and trade amendments, are electronically and automatically transmitted to CCASS from the stock exchange (i.e. SEHK) on each trading (T) day. There is no need for clearing participants to input or further confirm such trade details in CCASS. Clearing participants receive Provisional Clearing Statements of their stock and money positions through their CCASS terminals shortly after 18:00 and 20:00 hours on each T day for reconciliation. Final Clearing Statements are available to clearing participants shortly after 14:00 hours on T+1 day for confirmation purposes. All exchange trades are required to be settled on T+2 either via CCASS's Continuous Net Settlement (CNS) system or CCASS's Isolated Trades System.

Exchange trades are normally settled via the CNS system on a netting basis, unless isolated for settlement under the isolated trades system by the clearing participants at the time of the transaction or by the operator of CCASS (i.e. HKSCC) for risk management purposes. Under settlement on the CNS system, HKSCC becomes the settlement counterparty to both the buying and selling broker through novation. The single market contract between the clearing participants is novated into two market contracts, one between the delivering clearing participant and HKSCC; and the other between the receiving clearing participant and HKSCC. Acting as the settlement counterparty, HKSCC provides a form of settlement guarantee. The stock transactions of a clearing participant in the same security on the same day are offset against each other, resulting in a single net stock position for the day. Any outstanding unsettled net stock positions of a clearing participant at the end of a settlement day are carried forward to the next settlement day and continuously netted against any opposite stock positions due for settlement in the same security.

Exchange trades isolated for settlement on the Isolated Trades System are settled on a trade-

for-trade basis. HKSCC does not substitute itself as the settlement counterparty to isolated trades; it facilitates but does not guarantee settlement.

#### 4.4.2.5 Arrangements for money settlement in CCASS

CCASS money settlement services are provided for all exchange trades of SEHK settled on a DVP basis, where delivery of securities occurs only if payment occurs. Trades settled via the CNS system are always on a DVP basis, thus money settlement services are provided by CCASS. For exchanges trades settled via the Isolated Trades System, participants can choose to settle them on either a DVP or FOP basis. If participants choose to settle on a DVP basis, money settlement services are provided by CCASS. If participants choose to settle on a FOP basis, they need to conduct money settlement outside CCASS.

Under CCASS money settlement, each participant establishes an account at a designated bank and authorizes HKSCC (i.e. the operator of CCASS) to initiate electronic instructions to debit or credit its designated bank account. Book-entry money records are generated for a participant in its money ledger with respect to its settlement and other financial obligations due to or from HKSCC. The money positions arising from a clearing participant's trades settled under the CNS system in each stock position are netted, resulting in a single net amount due to or from the participant. This is settled by direct debit or credit instruction issued by HKSCC to the designated bank of the participant at the end of the settlement day. Settlement is processed through the clearing system of HKICL (i.e. Hong Kong's interbank RTGS system) against participants' designated bank accounts.

Money settlement by clearing participants through their designated banks is generally confirmed in the morning on T+3 (T+3 finality arrangement). In addition to the settlement run for CCASS T+3 money settlement in HKD, USD and RMB, a new settlement run for CCASS T+2 money settlement (T+2 finality arrangement) in HKD, USD and RMB was implemented on 25 July 2011.

#### 4.4.2.6 CCASS Depository

The CCASS Depository acts as the CSD and accepts deposits of eligible securities from participants for settlement and safe custody. Participants of CCASS deposit their shares in the CCASS Depository. Within CCASS, those shares will be credited to the accounts of the depositing participants in the form of electronic book entries.

#### 4.4.2.7 Risk Management of CCASS

The basic features of the risk management of CCASS by HKSCC as the operator are as follows:

##### a) Securities-on-hold

All exchange trades of SEHK are due for settlement on the second trading day following the transaction (i.e. T+2). On T+2, CCASS collects shares from the accounts of clearing participants with net short stock positions and allocates shares to the accounts of clearing participants with net long stock positions under the CNS system. Money ledgers of participants would also be updated simultaneously. Money settlement by clearing participants through their designated banks is generally confirmed in the morning on T+3.

Securities for which payment has not been confirmed are put on hold on T+2 and clearing participants are not allowed to use or withdraw them. However, a clearing participant can

make a cash prepayment to CCASS, or provide it with a bank guarantee, in order to have immediate delivery of the securities.

b) Marks

As mentioned in section 4.4.2.4, HKSCC acts as the counterparty for exchange trades settled via the CNS system of CCASS. As a CCP to the CNS trades, HKSCC is exposed to market risk as a result of unfavourable fluctuations of prices of the unsettled stock positions. HKSCC evaluates such risk with reference to the difference between the market value of the stock position and the original contract value. The difference is collected from clearing participants in the form of marks, which reflects the level of risk expressed in money terms. All open positions are marked to market daily at the end of the day. Clearing participants of CCASS have to pay net unfavourable marks in cash or by using stock as collateral to HKSCC. The marking to market and collection of net unfavourable marks help to confine HKSCC's market risk to a single day's market fluctuations.

In addition, an intra-day marking to market on all open positions is performed at 11:00 am daily. Clearing participants are required to pay the intra-day marks if they are in excess of certain limit before 14:00.

c) Integrated surveillance

HKSCC has a real time surveillance system to monitor the trading activities and open positions of CCASS clearing participants in order to examine their exposure to risk relative to their financial resources. Clearing participants' positions are compared with their liquid capital and examined as to their degree of diversification in trading.

Moreover, clearing participants will be selected for investigation if, for example, they have material open positions concentrated in a few stocks, trade beyond an acceptable level or have a sudden surge in turnover.

KSCC has been working closely with the SFC and would inform each other promptly of any unusual trading and settlement activities, and clearing participants with financial problems.

d) Collateral

CCASS clearing participants may be required to put up collateral if their financial strength is in question, or their pattern of trading is creating excessive risk. The amount of collateral is decided by taking into account the level of the clearing participants' contributions to a Guarantee Fund (see part (e) below) and the clearing house's exposure to risk as CCP under the CNS system.

e) Guarantee Fund

A Guarantee Fund is in place to cover risks resulting from losses incurred as a result of guaranteeing the trades of CCASS clearing participants who become insolvent and the liabilities of HKSCC for defective eligible securities. The Fund will only be drawn on as a last resort. The Fund is made up of contributions from clearing participants, transfer from HKSCC's reserves and retained earnings.