

**Payment, clearing and  
settlement systems in  
Hong Kong SAR**



## Contents

List of abbreviations .....	203
1. Introduction.....	205
1.1 The general institutional framework .....	205
1.1.1 Payment systems and instruments .....	205
1.1.2 Securities settlement .....	206
1.2 The role of the HKMA .....	206
1.2.1 Oversight.....	207
1.2.2 Provision of services.....	208
1.2.3 Cooperative oversight arrangements .....	208
1.3 The role of other private and public sector bodies.....	208
1.3.1 Providers of payment services.....	208
1.3.2 Licensing and registration requirements for related securities service providers .....	211
1.3.3 Other service providers.....	211
1.3.4 Role of other private and public sector bodies .....	212
2. Payment methods.....	213
2.1 Cash payments.....	213
2.2 Non-cash payments.....	213
2.2.1 Non-cash payment instruments .....	213
2.2.2 Non-cash payment terminals .....	215
3. Payment systems .....	215
3.1 General overview.....	215
3.2 Large-value payment systems .....	215
3.2.1 The real-time gross settlement (RTGS) system for HKD.....	215
3.2.2 Real-time gross settlement (RTGS) systems for USD, EUR and RMB ...	220
3.3 Payment links .....	223
3.3.1 Cross-border PVP links .....	224
3.3.2 Payment links with the Mainland.....	224
3.3.3 Payment links with Macau .....	225
4. Systems for post-trade processing, clearing and securities settlement .....	225
4.1 General overview.....	225
4.2 Post-trade processing systems .....	225
4.2.1 Trade repository .....	225
4.3 Central counterparties and clearing systems .....	225
4.4 Securities settlement systems .....	226

4.4.1 Central Moneymarkets Unit .....	226
4.4.2 CCASS .....	229

## List of abbreviations

AI	Authorised Institution
AMS	Automatic matching system
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
DTCs	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	Multipurpose stored-value card
OCL	Octopus Cards Limited
OTC	Over-the-counter
POS	Point-of-sale
PPS	Payment-by-phone service

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

Designed to expedite economic transactions and financial intermediation in the region, Hong Kong SAR's financial infrastructure features a number of enhancements that smooth payment flows and allow banks to use liquidity more efficiently. The efficiency of these payment and settlement systems helps to consolidate Hong Kong's position as an international financial centre and a settlement hub of the region.

Hong Kong's financial infrastructure can be categorised into three components: 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 and delivery-versus-payment services, as well as external links to facilitate cross-border transactions.

### 1.1 The general institutional framework

Specific legal and regulatory requirements provide for the oversight of important payment systems in Hong Kong. Moreover, a number of laws have a 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 for the finality of settlement for transactions made through systems designated under the Ordinance by protecting the finality of settlement from insolvency laws or other legislation.

##### *Informal oversight of retail payment systems*

Unlike large-value interbank payment systems, retail payment systems, which handle large volumes of relatively low-value transactions, generally pose few, if any, systemic risks. The HKMA therefore considers that retail payment systems are in general not systemically significant enough 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 the system's safety and efficiency. 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 multipurpose 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 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 industry's compliance with the two codes of practice.

##### *Other relevant ordinances and regulations*

Section 3A(1) of the *Exchange Fund Ordinance* provides that the Financial Secretary may require authorised institutions (see Section 1.2.1.1) to open a settlement account with the HKMA and to operate it on such terms and conditions as the Financial Secretary considers appropriate. The Financial Secretary delegates this power to the Monetary Authority.

The *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) and The Hongkong and Shanghai Banking Corporation 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, that is payable on demand.

The *Banking Ordinance* provides the HKMA with the power to regulate the issue of MPCs in Hong Kong. The regulatory regime aims to ensure the soundness of MPC schemes and their issuers. The Ordinance provides that licensed banks are deemed to be approved to issue or facilitate the issuing of MPCs, but that other entities that plan to issue MPCs must first apply for authorisation as a deposit-taking company (DTC).

In developing this regulatory framework, the HKMA seeks to strike a balance between the need to maintain the stability of the payment system and the desirability of not stifling developments which would promote competition and innovation in Hong Kong's MPC sector.

### **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 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 regulatory responsibility for takeovers and mergers activity, offers of investment products, and the enforcement of laws on market malpractice. Since March 2000, the SFC has been responsible for the regulation of all participants in the two exchanges. As for listed companies, SEHK is the 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 with the HKEx. The memorandum covers 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. A separate memorandum of understanding covers 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 reviews of the operations of the depository and nominee services provided by Hong Kong Securities Clearing Company Limited (a subsidiary of HKEx). For its part, 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 the 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 under the CSSO as an overseer of the important clearing and settlement systems with the aim of promoting their safety and efficiency. The CSSO also provides statutory backing for settlement finality in transactions made through systems designated under the CSSO by protecting settlement finality from insolvency laws or any other legislation.

The HKMA was established on 1 April 1993 when the Office of the Exchange Fund merged 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. The HKMA's main functions and policy objectives are to:<sup>1</sup>

- maintain currency stability within the framework of the Linked Exchange Rate System;
- promote the stability and integrity of the financial system, including the banking system;
- help to preserve Hong Kong's status as an international financial centre by, for example, developing and maintaining Hong Kong's financial infrastructure; and
- manage the Exchange Fund.

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

- banknote issuance. Hong Kong's HKD 20, 50, 100, 500 and 1,000 notes are currently issued by three commercial banks. These are The Hongkong and Shanghai Banking Corporation, the Standard Chartered Bank and the Bank of China (Hong Kong). The HKMA issues only HKD 10 notes on behalf of the government.
- 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.

The 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 are 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, EURO 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 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

---

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

HKMA an annual self-assessment report and report to the HKMA any incident which could materially affect cardholders in Hong Kong.

### **1.2.2 Provision of services**

All Licenced Banks (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 require an authorised institution to open a settlement account with the Monetary Authority for the account of the Exchange Fund. The account must 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.

In May 2000, the HKMA announced that Restricted Licence Banks (RLBs) in Hong Kong could also access the HKD CHATS, provided that they can demonstrate 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 Central Moneymarkets Unit (CMU) is a business unit of the HKMA specialising in the clearing and settlement of debt securities. The HKMA plays no part in the settlement of equity securities (see Section 4).

### **1.2.3 Cooperative 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 cooperative 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 cooperative 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 cooperates 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 US dollar/Indonesian rupiah PVP link between the USD CHATS and Bank of Indonesia's RTGS system and the US dollar/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, licensed banks, restricted licence banks and deposit-taking companies. They are collectively known as "Authorized Institutions" (AIs) under the Banking Ordinance.

Under the Banking Ordinance, the HKMA is the authority responsible for the authorisation, suspension and revocation of all three types of AI status. Checks and balances are provided in the Banking Ordinance with the requirement that the HKMA consults the Financial

Secretary on important authorisation 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 HK dollars. 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. Since May 2000, RLBs with a clear business need have been permitted to open settlement accounts with the HKMA and to join the HKD CHATS for the settlement of HK dollars. However, they are not allowed to participate in the clearing of cheques as they are not allowed to operate current accounts for customers.

Deposit-taking companies (DTCs) are mostly owned by, or associated with, banks. They engage in a range of specialised activities, including consumer finance and securities business. These companies may take deposits of HKD 100,000 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.

Als must comply with the provisions of the Banking Ordinance, which, among other things, requires them to maintain adequate liquidity and capital adequacy ratios, submit periodic returns to the HKMA, adhere to limits on loans to any one customer or to directors and employees, and 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 organisation representing the banking industry that all banks in Hong Kong must join as members. HKICL was established in May 1995 to take over the HK dollar clearing functions provided by the former Management Bank of the Clearing House, The Hongkong and Shanghai Banking Corporation (HSBC). The principal activity of HKICL is the provision of interbank clearing and settlement services to banks in Hong Kong. In other words, HKICL is the system operator for the HKD CHATS.

HKICL is also the system operator for the foreign currency payment systems (including US dollar, euro and renminbi), 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 that provides its participants with book-entry settlement for securities, either free of, or against, payment.

Only securities listed or traded on the exchange are accepted for settlement in CCASS and only brokers, clearing agencies, custodians, stock lenders and stock pledgees based in Hong Kong or such other persons as HKSCC may determine can be accepted as participants. HKSCC may 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 a nominee service.

Building upon the capability of the RTGS systems in Hong Kong, the HKMA has extended the delivery versus payment (DVP) facility for debt securities transactions to shares transactions. A link between HKICL and CCASS was set up in May 1998 to provide a DVP facility for shares denominated in HK dollars in order to reduce settlement risks and improve settlement efficiency. Following the implementation of US dollar and renminbi clearing systems in Hong Kong, the DVP facility was extended to shares transactions denominated in US dollars in August 2000 and in renminbi in October 2010 respectively.

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

Established in 1990, the CMU 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 HK dollar-denominated debt securities.

Starting in December 1994, the CMU has established one-way links to international central securities depositories such as Euroclear and Clearstream. This helps to promote Hong Kong's domestic debt securities to overseas investors, who can use these links to participate in Hong Kong's debt market. The CMU has also set up a network of bilateral linkages with other 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 HK dollar-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 (ie the USD CHATS, Euro CHATS and RMB CHATS) in Hong Kong, the CMU system established a seamless interface with the RTGS systems for the US dollar, euro and renminbi 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 US dollar-, euro- and renminbi-denominated debt securities. Furthermore, these interfaces enable automatic intraday repos, as a means of providing 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 with a standardised 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:

- (i) a corporation licensed by the SFC for the regulated activity (ie, a Licensed Corporation); and
- (ii) a bank (or authorised financial institution) registered with the SFC for the regulated activity (ie, 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 applicants satisfy the SFC or the HKMA that they are “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 (UnionPay) set up its credit card business in Hong Kong in 2004 and its operations have been growing since then. American Express and Diners Club International operate their charge card business mainly on a standalone or vertically integrated basis. That is, they perform the multiple roles of network provider, card issuer and merchant acquirer themselves. JCB International (JCB) issues cards and acquires merchants on its own. It also receives membership royalty fees from other institutions for the issuance of JCB cards in Hong Kong.

---

<sup>2</sup> Nine types of regulated activities are 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.

### 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 the Payment by Phone Service (PPS) and bill payment services.

Founded in 1984, EPSCO is currently a consortium of 21 major banks in Hong Kong. Member banks do not issue separate cards for the payment services because the functions are typically included in bank 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 free of charge and does not impose a minimum service charge on participating retailers. At present, EPS is accepted at more than 25,000 locations in Hong Kong, Macau and Shenzhen.

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

JETCO was established in 1982 by a small group of five banks to operate an interbank ATM network. Today, JETCO has extended its services to more than 30 member banks in Hong Kong and Macau. 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 POS terminals at designated retail outlets in Macau that display the JETCO logo. 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. This contactless MPC is used primarily to pay fares on public transport services run by the five transport operators that jointly own OCL (see Section 2.5.3).

## **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 Restricted Licence Banks and Deposit-Taking Companies. 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 popular way of making a retail payment in Hong Kong. At the end of 2009, HK dollar notes and coins in circulation amounted to HKD 208 billion, representing 12.8% of 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.

The denominations of notes in circulation in Hong Kong are HKD 10, HKD 20, HKD 50, HKD 100, HKD 500 and HKD 1,000. The government, through the HKMA, has authorised three commercial banks to issue banknotes in Hong Kong: these are The Hongkong and Shanghai Banking Corporation, the Standard Chartered Bank (Hong Kong) and the Bank of China (Hong Kong). In addition, the government issues HKD10 notes via the HKMA. Whether issued by the three note-issuing banks or directly by the government, HKD10 notes are issued or redeemed in US dollars against payment to or from the government's Exchange Fund at a specified rate of USD 1 to HKD 7.80 under the linked exchange rate system. The US dollar backing for issued notes is deposited with the Exchange Fund in exchange for certificates of indebtedness, which can be exchanged for banknotes.

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

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

##### *2.2.1.1 Credit transfers*

The majority of credit transfers are standing orders whereby a payer instructs their bank to debit their account and transfer a set amount to the payee on a regular specific date, usually monthly. Payroll crediting is the most common form of direct credit transfer.

After individual instructions are processed together with the bulk credit instructions for that day, the net obligations between banks are settled in the RTGS interbank payment system. More than 10 million credit transfers were processed by HKICL in 2010 for a total value of about HKD 296 billion.

##### *2.2.1.2 Direct debits*

Standing direct debit instructions are commonly used by households for regular payments such 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-authorised by the paying customer, who authorises the bank to debit his or her account on receipt of instructions initiated by the specified payee.

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. More than 38 million debit transfers were processed by HKICL in 2010 for a total value of about HKD 87 billion.

##### *2.2.1.3 Cheques*

Corporations and individuals in Hong Kong often use cheques as a payment method. As a retail payment method, cheques are also often used in transactions where debit cards or credit cards are not accepted (eg in payments for large-value items such as motor cars or deposits when purchasing property). Cheques are also used for some smaller-value items such as payment of utility bills, but alternative 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 in value to some HKD 31 billion on average 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 cleared value of such cross-border cheques is minuscule compared with that of the daily cheque processing in Hong Kong.

#### 2.2.1.4 *Payment cards*

##### (i) *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 outstanding receivables of more than HKD 78 billion in the third quarter of 2010. The credit cards used in Hong Kong include Visa, MasterCard, CUP, American Express, Diners and JCB International (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 cardholders settle their accounts 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 close to 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 HKD 500 without the need for signature verification.

##### (ii) *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 the direct transfer of funds from the purchaser's bank account to that of the retailer, which is effected at the POS using a bank ATM card or a credit card with an 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 via the POS but the account of the payee is credited by a batch run at the end of the same day or early the next day.

##### (iii) *Other cards – multipurpose stored-value cards*

Multipurpose stored-value cards are 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 an MPC involves the prepayment of funds by the cardholders to the card issuers. The total value of these prepayments effectively constitutes a float. As the

question of float management is of prudential concern to both the HKMA and the public, this is one of the considerations that led to the authorisation of OCL as a DTC (see below), thus bringing it under the HKMA's regulatory regime.

Octopus Card is a contactless MPC issued by OCL. The card scheme was first launched in the third quarter of 1997, initially as a means of paying public transport fares.

In April 2000, OCL, formerly known as Creative Star Limited, was authorised as a special purpose DTC under the Banking Ordinance. The authorisation allows the Octopus Card to be used more widely, thus enhancing its convenience for cardholders. Its non-transport-related applications now include car parking fees, 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 by non-transport service providers is subject to the conditions set down by the HKMA when it authorised the company as a DTC.

More than 20 million Octopus Cards were in circulation by the end of 2010, generating over 11 million transactions per day. Octopus Card is also accepted at more than 20 outlets in the Shenzhen region of Mainland China. Payments made in these outlets are denominated in HK dollars.

### **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. They are used mainly to pay utility bills and other charges.

EPSCO operates PPS, which offers payment services over the phone and on the internet, and ETC bill payment, which is available only on ETC ATMs (by using ETC ATM cards). On the other hand, JET Payment, the payment scheme operated by JETCO, is available on JETCO ATMs (by using JETCO member banks' ATM cards) and on the internet. Consumers must register in advance to use PPS but there is no such requirement for the other two 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 support interbank transfers in the HK dollar, US dollar, euro, and renminbi. Banks can then extend money transfer services to their customers. Hong Kong Interbank Clearing Limited (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 jurisdictions 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, known as HKD CHATS, was launched in December 1996.

### 3.2.1.1 Institutional framework

The HKD CHATS was deemed to be designated as a systemic system under the CSSO in 2004, and thus the settlement of transactions made through the system is final and irrevocable. At the same time, the system was also granted a certificate of finality, in view of its compliance with the security and efficiency requirements under Section 7(1) of the CSSO. The certificate of finality provides statutory backing for the finality of settlement for transactions settled through the system. This finality is protected by the CSSO from insolvency laws and other legislation.

The settlement institution (SI) for the HKD CHATS is the HKMA through the Payment Systems Operation Division of its Financial Infrastructure Department (FID). The SI in turn appoints Hong Kong Interbank Clearing Limited (HKICL), which is jointly owned by the HKMA and the Hong Kong Association of Banks (HKAB), as the system operator of the HKD CHATS. The HKAB represents the interests of the banking community in Hong Kong (see Section 1.3.4.1).

### 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 could also access the HKD CHATS if they could demonstrate a business need to do so. As at the end of 2010, some 141 settlement accounts were maintained with the HKMA.

### 3.2.1.3 Types of transactions handled

#### (i) Large-value RTGS transactions

HKD CHATS transactions are settled in real time on a gross basis across the books of the HKMA. The payments are final and irrevocable once the funds are transferred across the books of the HKMA.

#### (ii) 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, 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 RTGS system operator is HKICL. The system is open from 08:30 to 18:30 (Hong Kong Time) every working week, Monday to Friday. Interbank transactions can be settled during these operating hours. Transactions for end-customers must be submitted before 18:00 for same-day settlement.

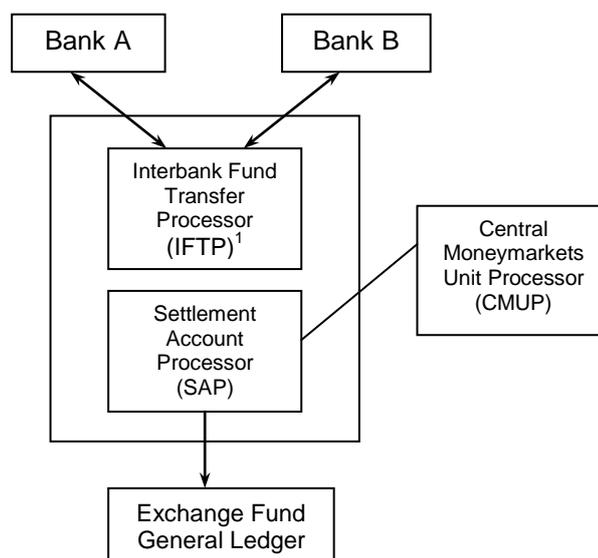
### 3.2.1.5 Settlement procedures

Since May 2009, the HKD CHATS has been operating on the SWIFTNet platform, which helps to enhance interoperability between domestic and international messages for payment instructions. This makes it easier for overseas institutions to join the RTGS systems in Hong Kong. Participating banks exchange payment messages with CHATS via SWIFTNet FIN Y-Copy service, which allows message senders to forward a copy to a third party (the system operator) for authorisation or further processing before sending the message 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>1</sup> IFTP is a real-time computer system designed to process interbank payment transactions electronically and provides administrative functions so that HKICL can monitor, maintain and control the IFTP.

Diagram 1 depicts the basic system design of HKD CHATS. The system comprises a Settlement Account Processor (SAP) and an Interbank Fund Transfer Processor (IFTP). The IFTP is a computer system designed to process interbank fund transfer transactions in real time. 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 Central Moneymarkets Unit Processor (CMUP) is to support intraday and overnight repo transactions through which members can obtain intraday liquidity or overnight funding as needed.

All member banks are required to strictly adhere to the operational rules set out 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 settlement institution of the HKD CHATS and the system is operated by HKICL.

All RTGS transactions are settled in 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 vs payment (DVP)*

Since a seamless interface between SAP and CMUP was established in December 1996, the HKD CHATS has supported a real-time and end-of-day DVP facility for HK dollar-denominated debt securities lodged with the CMU. A similar seamless interface was also established with CCASS. Market participants can make use of this linkage to arrange real-time and end-of-day DVP for HKD-denominated shares that are listed on SEHK.

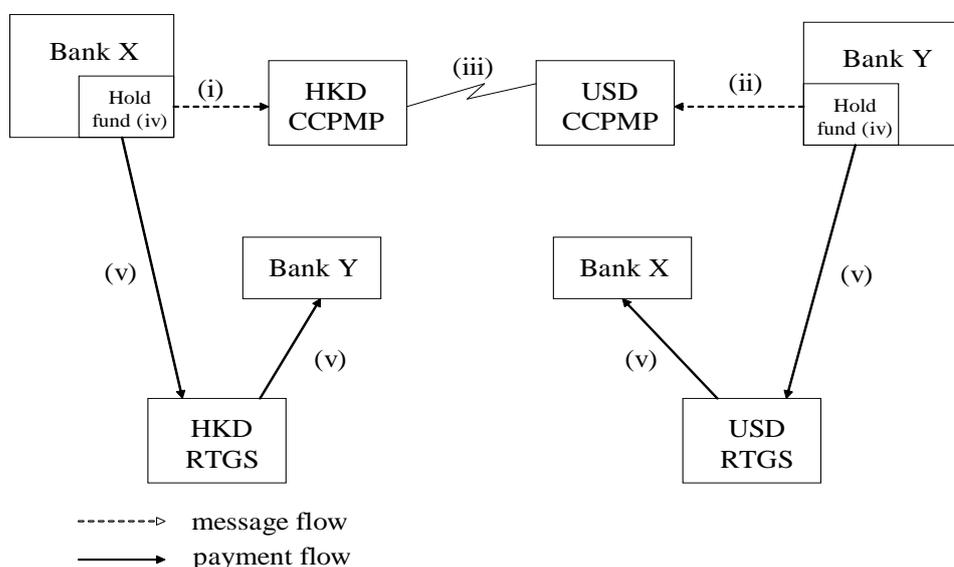
*Payment vs payment (PVP)*

The HKD CHATS is linked with the USD CHATS, EURO CHATS and RMB CHATS (see Section 3.2 for information on these foreign currency clearing systems in Hong Kong) for PVP settlement of USD/HKD, EUR/HKD and RMB/HKD foreign exchange transactions respectively. This PVP device (which is known as the Cross-Currency Payment Matching Processor, or CCPMP) was the first electronic foreign exchange PVP mechanism to ensure simultaneous settlement of both legs of these foreign exchange transactions, thus eliminating Herstatt risk. With PVP settlement and the consequent elimination of Herstatt risk, the application of bilateral counterparty trading limits is no longer relevant, and traded currencies can be put to immediate use in the respective clearing systems, thus improving interbank liquidity.

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

Diagram 2

**Operational 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.

- (i) **Liquidity management:** the availability of intraday liquidity is crucial in an RTGS system if the potential for payment gridlock is to be reduced. In this regard, the HKD CHATS has various features that facilitate liquidity management for banks. Banks can view the balance on their settlement accounts in real time. 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 purposes as necessary.
- (ii) **Repo facility:** banks can arrange with the HKMA to obtain liquidity through a repo facility. If a bank does not have a sufficient balance in its settlement account to effect an outgoing payment during the day before the intraday repo cutoff time, 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 credit balance required 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 on which interest is charged by the HKMA. In addition, banks can arrange overnight repos with the HKMA manually through the Discount Window facility as required.
- (iii) **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 by cancellation and re-sequencing.
- (iv) **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.
- (v) **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 in phases through 2007–08. Each bank is now required to have released and settled not less than 35% of its interbank RTGS payments (by value) for the day by 13:30, and 70% of them by 16:30. The HKMA closely monitors banks' compliance with throughput targets and opens discussions with individual banks if they consistently underperform.
- (vi) **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.
- (vii) **Confidentiality:** although banks input the full details of their payment instructions, including customer information, into IFTP, their instructions are stripped so that only the settlement instruction (ie information on the amount, the paying bank and the receiving bank) of the payment instruction is passed onto the SAP.
- (viii) **Liquidity Optimisers:** the HKD CHATS features two types of optimiser that help increase liquidity efficiency. The first is the 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. Apart from scheduled RLO runs at set intervals, runs can also be triggered

by the HKMA as necessary. The second type of optimiser helps to improve liquidity efficiency by netting bulk settlement payments in a bulk settlement run. This category includes the 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, making it simpler for overseas institutions to join the RTGS systems in Hong Kong and thus reinforcing Hong Kong's status as an international financial centre.

## 3.2.2 Real-time gross settlement (RTGS) systems for USD, EUR and RMB

There are three foreign currency RTGS systems in Hong Kong, which include the US dollar, euro and renminbi RTGS systems.

### 3.2.2.1 Institutional framework

The US dollar RTGS system in Hong Kong (known as USD CHATS) was launched in August 2000, while the euro RTGS system in Hong Kong (known as EURO CHATS) was launched in April 2003. The purpose of the USD and EURO CHATS is to provide efficient settlement of US dollar and euro transactions during Asian business hours. Given Hong Kong's role as an international financial centre, and the US dollar's and the euro's role as two of the world's most important currencies, there is a strong business case for improved mechanisms for settling US dollar and euro payments in Hong Kong. The settlement institutions of the USD and EURO CHATS are commercial banks appointed by the HKMA with franchise renewal every five years.

The renminbi RTGS system in Hong Kong (known as RMB CHATS) was launched in June 2007 as an upgrade from the Renminbi Settlement System established in March 2006. It caters for the settlement needs arising from the increasing volume of renminbi business in Hong Kong. The clearing bank 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 nation's real-time gross settlement system.

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

- The settlement institutions (SIs)/clearing bank (CB) for the foreign currency RTGS systems are commercial banks. Each direct participant opens and maintains a settlement account with the SIs/CB and all transactions are settled across the books of the SIs/CB.

- The USD and EURO 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 that are approved by the HKMA and the SI.
- Unlike the HKD CHATS, the USD SI and EUR SI provide a clean intraday overdraft facility to the direct participants in the system to facilitate their liquidity management.

### 3.2.2.2 Participation

Participation in the USD CHATS, EURO CHATS and RMB CHATS is not mandatory. At the end of 2010, the USD CHATS had 224 participants, the EURO CHATS 50, and the RMB CHATS 96. Most of the participants are banks.

### 3.2.2.3 Types of transactions handled

#### (i) Large-value RTGS transactions

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

#### (ii) Small-value bulk clearing items

The USD CHATS and RMB CHATS have fewer bulk clearing and settlement items than the HKD CHATS, and there are currently no bulk clearing and settlement items for the EURO 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, a series of enhancements to the RMB CHATS has created 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, EURO 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, EURO CHATS and RMB CHATS have operated on all Hong Kong general holidays, except 1 January which is a holiday worldwide. This facilitates the use of Hong Kong's RTGS systems by local and overseas institutions 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 settlement institutions of the USD CHATS and EURO CHATS are The Hongkong and Shanghai Banking Corporation and Standard Chartered Bank (Hong Kong) respectively, while the clearing bank of the RMB CHATS is Bank of China (Hong Kong).

#### (i) RTGS

All RTGS transactions are settled real-time on a gross basis. When a payment is settled across the books of the settlement institution or clearing bank, it is regarded as final and irrevocable.

#### (ii) 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.

*(iii) Delivery vs payment (DVP)*

The USD CHATS, EURO CHATS, RMB CHATS are linked up with the CMUP (ie 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, euro 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.

*(iv) Payment vs payment (PVP)*

The HKD, USD, EUR and RMB CHATS are linked together for the PVP settlement of USD/HKD, EUR/USD, USD/RMB, EUR/HKD, EUR/RMB, RMB/HKD foreign exchange transactions. This PVP device, which is known as the CCPMP, ensures that both legs of the foreign exchange transaction are settled simultaneously to eliminate Herstatt risk.

The USD CHATS has also established PVP links with Malaysia's ringgit RTGS system and Indonesia's rupiah RTGS system to improve the settlement efficiency of the US dollar/ ringgit and the US dollar/rupiah pairs and reduce the attendant Herstatt risk.

### *3.2.2.6 Management of credit and liquidity risk*

Various risk management measures are instituted:

- (i) Management of liquidity: like the HKD CHATS, the USD CHATS, EURO CHATS and RMB CHATS have features that facilitate liquidity management for the participating banks. Banks can monitor the balance on their settlement accounts in real time. In addition, they 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.
- (ii) Intraday overdraft: in contrast to the HKD CHATS, the direct participants of the USD CHATS and EURO CHATS may go into overdraft by making use of the interest-free intraday overdraft facility provided by the respective settlement institutions for the US dollar and euro. When a direct participant does not have a sufficient credit balance to effect its payment instructions, the bank can make use of the overdraft provided to complete its payments to counterparties.
- (iii) Repo facility: as in the HKD CHATS, participating banks of the USD CHATS and EURO CHATS can obtain liquidity through a repo facility. If a bank does not have a sufficient balance on 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 credit balance required 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 are rolled into overnight borrowing on which the settlement institution charges interest. A similar intraday-day repo facility for the RMB CHATS will be launched in early 2011.
- (iv) Queuing mechanism: as in the HKD CHATS, transactions are queued in the USD, EUR and RMB CHATS systems if a bank does not have sufficient balance on its settlement account to effect its payments. The bank can make use of the re-sequencing function to move a selected transaction up or down its list of queued payments. The queuing mechanism lets banks manage their own queues of payment instructions by cancelling and resequencing them.

- (v) **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 issues relevant to the users of the foreign currency clearing systems.
- (vi) **Throughput guidelines:** as in the case of the HKD CHATS, participant banks in the USD CHATS and EURO CHATS must comply with the CHATS throughput guideline by which each direct participant is required to release and settle interbank payments that are not less than 35% of the value of its total CHATS payments for the day by 13:30 and those of not less than 70% by 16:30.
- (vii) **Confidentiality:** as in the HKD CHATS, only the settlement instruction (ie information on the amount, the paying bank and the receiving bank) of the payment instruction is passed onto the foreign currency SAP.
- (viii) **Liquidity Optimisers:** as in the HKD CHATS, the foreign currency CHATS feature the RTGS Liquidity Optimiser (RLO) to improve their liquidity efficiency. CHATS Optimiser, CCASS Optimiser and Cross-Currency CHATS Optimiser will soon be introduced to the RMB CHATS to cater for the growing volume of renminbi business in Hong Kong.

#### 3.2.2.7 Pricing

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

#### 3.2.2.8 Enhancements to the RMB CHATS

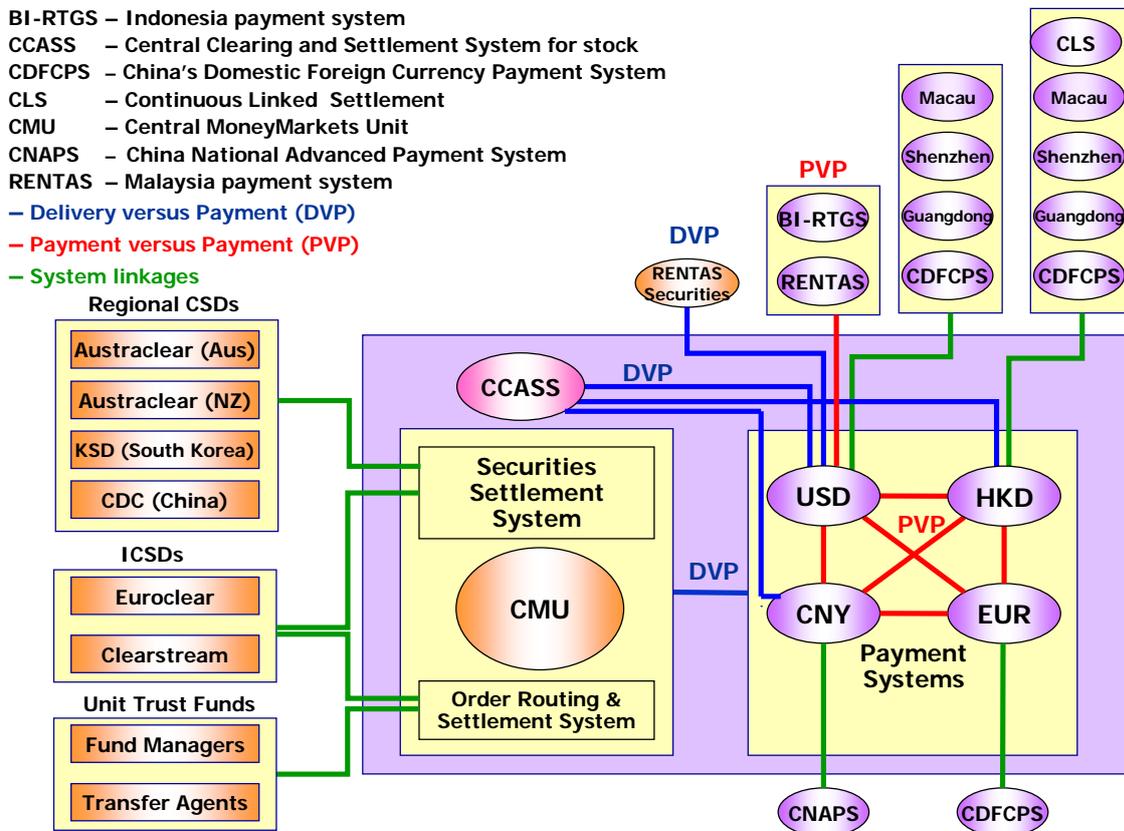
A new liquidity saving device, the RTGS Liquidity Optimiser (RLO) and a new DVP function for supporting listing of RMB-denominated securities on SEHK were recently added to the RMB CHATS. These are intended to support the new business opportunities from the growing volume of renminbi business in Hong Kong, especially under the revised Settlement Agreement on the Clearing of Renminbi Businesses between People's Bank of China and the Clearing Bank of the RMB RTGS system (the revised Clearing Agreement) effective from July 2010. The functionalities of the RMB CHATS will be gradually brought into line with those of the HKD CHATS to ensure that the system is capable of supporting a full range of financial activities.

### 3.3 Payment links

Over the years, the HKMA has built a robust and efficient multicurrency payments 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 with the Mainland.

Diagram 3

**Hong Kong’s multicurrency payment and settlement infrastructure**



**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 zone differences and time lags in settlement. 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 growing demand. The HKMA has established links for both HKD and USD CHATS with Shenzhen and Guangdong. These allow the efficient and safe settlement of cross-border payments in HK dollars and US dollars between banks in Hong Kong and their counterparts in Shenzhen and Guangdong.

Hong Kong has also established two-way clearing arrangements for HK dollar-denominated cheques with Guangdong and Shenzhen, as well as joint two-way US-dollar cheque clearing with Shenzhen, and one-way renminbi 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 vice versa. The one-way RMB joint cheque-clearing at present only covers RMB cheques drawn on banks in Hong Kong and presented in Shenzhen and Guangdong.

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 HK dollars, US dollars, euros and sterling payments between the Mainland's Domestic Foreign Currency Payment Systems and the HKD, USD and EURO CHATS in Hong Kong. Settlements for transactions denominated in sterling are made through a correspondent bank in Hong Kong. These arrangements allow Mainland and Hong Kong banks to manage their liquidity more efficiently and provide cross-border payment services competitively in the Asian time zone, thus reducing settlement risk. While the operating mechanism is similar to that of the HK dollar and US dollar RTGS links with Shenzhen and Guangdong, the geographical coverage has been expanded to a wider range of Mainland cities.

### **3.3.3 Payment links with Macau**

The one-way joint clearing facility for HK dollar-denominated cheques between Hong Kong and Macau was launched in August 2007 and a similar facility for US dollar cheques was launched in June 2008 to meet growing demand. These facilities reduce the time required for clearing HK dollar and US dollar 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 Central Moneymarkets Unit (CMU) operated by the HKMA for the clearing and settlement of government-issued and private sector debt securities, and the CCASS operated by the Hong Kong Securities Clearing Company (HKSCC) for the clearing and settlement of equity securities traded on the Stock Exchange of Hong Kong (SEHK). Both the CMU and the CCASS act as central securities depositories (CSDs). While the CMU is not a central counterparty (CCP), CCASS is a central counterparty securities settlement system.

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

#### **4.2.1 Trade repository**

The HKMA will establish a local trade repository for OTC derivatives by end-2012. The initiative responds to the G20's commitment to accelerate the implementation of OTC derivatives regulation and supervision and to increase transparency and standardisation in the OTC derivatives markets. The trade repository will cover a number of standardised OTC derivatives asset classes. A linkage will be developed between the trade repository and the central counterparty clearing facility for OTC derivatives to be launched by the SEHK to allow eligible transactions to be passed to the central counterparty 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 central counterparty securities settlement system (see Section 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 Exchange Fund Bills and Notes (EFBN), bonds issued by the government of the Hong Kong SAR, and debt securities issued by both public and private sector entities; and
- 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 act as CSDs (see Sections 4.4.1.6 and 4.4.2.6 for a brief overview).

##### **4.4.1 Central Moneymarkets Unit**

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

Securities products cleared and settled by CMU include the Exchange Fund Bills and Notes (EFBN), bonds issued by the government of the Hong Kong SAR, and debt securities issued by both public and private sector entities.

###### *4.4.1.2 Institutional framework for CMU*

The 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. The CSSO also protects the settlement finality of transactions effected through such designated systems from insolvency laws or other legislation. The CMU is deemed to have been designated under the CSSO since 4 November 2004 and all transactions effected through the CMU have since enjoyed statutory backing for their settlement finality.

###### *4.4.1.3 Participation in CMU*

There are two types of membership:

- (i) Recognised Dealers (RDs) and Market Makers (MMs): 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 degrees of commitment, the development of the EFBN market. RDs participate in the secondary market and promote EFBNs in the retail market. For their part, MMs are appointed from the pool of RDs and participate actively in the primary market. They 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, the GBP's RDs participate in the secondary market while some RDs are additionally appointed as PDs to participate actively in the primary market.
- (ii) CMU Members: Those who fulfil the following membership criteria are eligible to join the CMU as CMU Members to settle and clear private sector debt securities:
  - Als in Hong Kong and/or
  - 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 Maker/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 CMU settlement process

##### (i) 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 their CMT or SWIFT. Once the instruction is matched, it is stored in the system. When the funds and securities are sufficient, settlement takes place immediately. The securities accounts and settlement accounts of the buyer and the seller are debited and credited simultaneously. If the seller does not have sufficient securities, the system will retry at 15-minute intervals until the cutoff time. At this point, 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 held as 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 the transfer instructions of members with insufficient funds or securities are cancelled before final end-of-day settlement takes place.

##### (ii) Settlement

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

The CMU service offers two types of settlement mode: (i) delivery versus payment (DVP) and (ii) 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. Non-participants in the RTGS system must appoint a settlement bank to execute payments arising from their securities transactions.

Transactions for which real-time settlement is required are settled on a gross basis. The real-time window is open from 8:30 until 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 Section 4.4.1.4, payments for transactions are executed through the interbank payment systems in HK dollars, US dollars, euros or renminbi either in real time (via RTGS) or through a batch of direct debit and credit transactions generated by the system at the end-of-day settlement run.

Non-participants in the interbank payment system must appoint settlement banks to execute payments arising from their 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 with 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 regional CSDs 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 central counterparty for securities transactions and does not guarantee settlement. Settlement of transactions will fail if buyers have insufficient funds or sellers have insufficient securities. Failed transactions are automatically cancelled from the system when the CMU system closes.

Nor does the CMU grant credit facilities to its members for the purpose of settling securities transactions. Bank members can obtain the necessary intraday liquidity through automatic intraday repo transactions with the SIs of the payment systems. Therefore, the CMU is not exposed to the credit risk of its members.

For its part, the CMU system creates no credit exposures between its members arising from the settlement of securities transactions because the CMU provides both real-time and end-of-day DVP facilities to its members. However, as the settlement is not guaranteed, a CMU member may be liable for 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.

To assure business continuity, the CMU has a hot backup site located outside the central business district. Production data is copied to the site in real time. In the event of any disruption at the production computer centre, the backup site can be activated within half an hour. A detailed contingency plan covers clearing and data processing using the remote site. The plan addresses both a major operational failure at the production site and the failure of a participant's CMU terminal.

To mitigate operational risks, the CMU has a comprehensive system of internal controls and procedures, which are subject to both internal and external audits. Internal auditing is continuous while the external audit takes place annually.

The Audit Commission is the external auditor of the government's accounts. It provides independent audit services to the Legislative Council and public sector organisations to assure the efficient and effective use of public resources and to enhance public sector accountability in Hong Kong.

The HKMA's internal auditor has the primary objective of assisting the HKMA's management in the effective discharge of its responsibilities and functions. This is achieved through comprehensive audit coverage to ensure that the HKMA's assets and resources 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*

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 such as 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 overseen by the Securities and Futures Commission (SFC), which is an independent statutory body under the Securities and Futures Ordinance (SFO). HKSCC is required under the SFO to ensure that (i) there are orderly, fair and expeditious clearing and settlement arrangements for securities or futures contracts cleared or settled through CCASS; and that (ii) 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 – which must be exchange participants of the Stock Exchange of Hong Kong (SEHK) and corporations licensed to carry out dealing in securities under the SFO.
2. General Clearing Participants – which must be corporations licensed to carry out dealing in securities under the SFO or institutions that are registered to carry out securities dealing under the SFO.
3. Custodian Participants – which must be authorised institutions (AIs) under the Banking Ordinance, or trust companies registered under the Trustee Ordinance, or corporations licensed to carry out dealing in securities under the SFO but not exchange participants of SEHK. The HKMA is also a Custodian Participant under the Exchange Fund Ordinance.
4. Investor Participants – Individual Investor Participants must be individuals aged 18 or above, holding Hong Kong or Macau Resident identity cards and not subject to any legal incapacity; Joint Individual Investor Participants must be individuals aged 18 or above, holding Hong Kong identity cards and not subject to any legal incapacity; Corporate Investor Participants 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 – must have established stock lending business in Hong Kong in securities listed on SEHK or 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 – must be AIs under the Banking Ordinance or licensed money lenders under the Money Lenders Ordinance and have an 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.
7. Clearing Agency Participants – 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 central securities depository system or similar systems.

All exchange participants of SEHK must become CCASS clearing participants or have made arrangements with General Clearing Participants to clear on their behalf under SEHK rules.

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

CCASS determines the 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' ledgers on settlement day.

Details of all exchange trades (ie trades of eligible securities executed on SEHK), including trade data and trade amendments, are electronically and automatically transmitted to CCASS from the stock exchange (ie SEHK) on each trading 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 trading day for reconciliation. Final clearing statements are available to clearing participants shortly after 14:00 hours on T+1 for confirmation purposes. All exchange trades must be settled on T+2 either via CCASS's Continuous Net Settlement (CNS) system or its 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 (ie 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. 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, whereby securities are delivered only against payment. Trades settled via the CNS system are always on a DVP basis, with money settlement services provided by CCASS. For exchange-based trades settled via the Isolated Trades System, participants can choose to settle them on either a DVP or a 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, money settlement must be conducted outside CCASS.

Under CCASS money settlement, each participant establishes an account at a designated bank and authorises HKSCC (ie 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 vis-à-vis 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 a 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 (ie 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 HK dollars, US dollars and renminbi, a new settlement run for CCASS T+2 money settlement (T+2 finality arrangement) in HK dollars, US dollars and renminbi was implemented in July 2011.

#### 4.4.2.6 CCASS Depository

The CCASS Depository acts as the central securities depository 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, shares are 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:

##### (i) *Securities-on-hold*

All exchange trades of SEHK are due for settlement on the second trading day following the transaction (ie 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 are simultaneously updated. Money settlement by clearing participants through their designated banks is generally confirmed in the morning of 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 take immediate delivery of the securities.

##### (ii) *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 central counterparty to CNS trades, HKSCC is exposed to market risk from movements in the prices of 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 (margins), which reflect 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 keep HKSCC's market risk exposure to within the value of a single day's market fluctuations.

*(iii) Integrated surveillance*

HKSCC continuously monitors the trading activities and open positions of CCASS clearing participants to track their risk exposures relative to their financial resources. Clearing participants' positions are assessed against their liquid capital and degree of diversification. Participants may be investigated if, for example, they have excessively concentrated open positions, are trading beyond an acceptable level or exhibit a sudden surge in turnover.

HKSCC works closely with the SFC, exchanging information on any unusual trading and settlement activities, or on clearing participants with financial problems.

*(iv) 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 reflects the level of the clearing participants' contributions to a Guarantee Fund (see paragraph (v) below) and the clearing house's exposure to risk as central counterparty under the CNS system.

*(v) Guarantee Fund*

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