Chapter 10

ROLE OF PAYMENT AND SETTLEMENT SYSTEMS IN MONETARY POLICY AND FINANCIAL STABILITY IN CHINESE TAIPEI

By
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1. Introduction

1.1 Purpose and Scope of Study

The purpose of this study is to offer insight into the state of Chinese Taipei's payment and settlement systems (PSSs) and their practical role in favour of Monetary Policy (MP) and Financial Stability (FS). This report will also identify the potential vulnerabilities and risks in the domestic systemically important PSSs. However, this does not mean that the risks mentioned in this report are certain to occur. It is hoped that the research findings will enhance the awareness of risk among the market participants and system operators and spur them to take appropriate action in a timely manner, in addition to serving as a reference for financial authorities.

This study is divided into five sections. Section 1 is a brief description of the current development of Chinese Taipei's economy, finance and payment infrastructure. Section 2 reviews the literature on the inter-connectedness of PSSs with respect to MP and FS. Section 3 focuses on the assessment of Chinese Taipei's CBC's Interbank Fund Transfer System (CIFS) in accordance with the "Core Principles" issued by Committee on Payment and Settlement Systems (CPSS), Bank for International Settlements (BIS). Section 4 abstracts the policy implication from the issues and assessment mentioned above. Finally, in Section 5, we draw the conclusion from this study.

1.2 Overview of Economy and Finance in Chinese Taipei

Export-led policy has successfully contributed to Chinese Taipei's vigorous economic growth and robust financial development, just like most other Asian

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countries. Although this growth model has been widely duplicated by the emerging market economies, especially the "Brick Four" - China, India, Brazil and Russia, Chinese Taipei is still well-known for its strong high-technology products, such as notebook computers, cell phones and wafer fabrication.

Both the Lehman Brothers events and the GIPS sovereign debt crises affected Chinese Taipei's economy during 2008-09. Soon after, the growth rate sprang back to 10.72% in 2010, the highest rate over the last decade, partly due to a lower base in the previous year. During 2001-2011, the average GDP growth rate was 4.1%; during the same period, the CPI inflation rate has maintained at a stable level with average inflation at 0.99%, compared to WPI average inflation 2.24% (see Figure 1).

Since Chinese Taipei has a small open economy, its growth and price level are deeply and widely influenced by the global economy and business cycle, even in such a case, the Central Bank, Chinese Taipei (henceforth, the CBC) has made every effort to conduct its interest rates and exchange rates policies in order to promote financial stability, guide sound banking operations, maintain the stability of the internal and external value of the currency, and foster economic development within the scope of the above objectives.

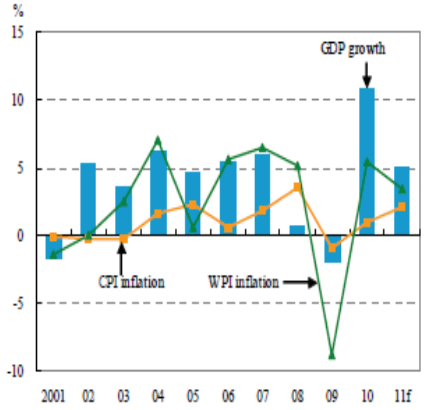
Chinese Taipei's weighted average interest rates of deposits and loans declined sharply to the historic lows. Deposits fell below 1% and loans came to around 2%, and their interest rates spreads shrank to 1.11% at Q2:2009, and subsequently expanded gradually to 1.4% at Q4:2011, but they are still less than the average before the crisis. That indicates sustained global economic recovery was underway, but fragilities remained in the financial system (see Figure 2).

In general, the New Chinese Taipei dollar (NT$) is flexibly floated against the US dollar. The exchange rates of NT$/US$ had gradually appreciated from 34.999 in 2001 to 29.418 in 2011. During the same period, Chinese Taipei's current account balances kept positive surplus and increased yearly. The ratios of the current account surplus to GDP are as high as between 5% and 11.5%. As a result, Chinese Taipei's foreign exchange reserves accumulated from US$122 billion in 2001 to US$386 billion in 2011, however, some belong to short-term capital inflows (some sort of hot money in nature).

Much of the hot money are usually channeled into the local capital markets and raises concerns about asset price bubbles. Moreover, the potential vulnerabilities to sudden reversals of capital inflows will pose policy challenges for the central bank to address the volatility of the exchange rates (see Figures

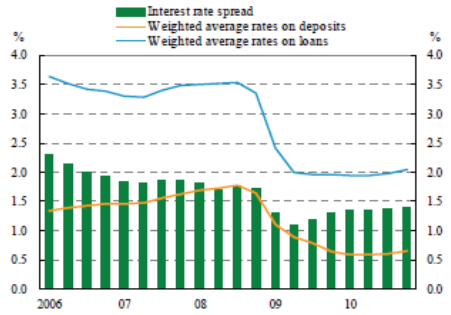
3 and 4). As we learned from the 1997 Asian financial crisis, heavy capital inflows have enabled the weaker enterprises to easily access funds by issuing bonds, resulting in a further deterioration in the credit quality of assets held by investors. Should interest rates unexpectedly rise in the advanced economies, economic prospects worsen in the emerging markets, or investor appetites change, it can lead to sudden reversals of capital inflows and compromise the soundness of the financial system.

Figure 1
Growth and Inflation in Chinese Taipei



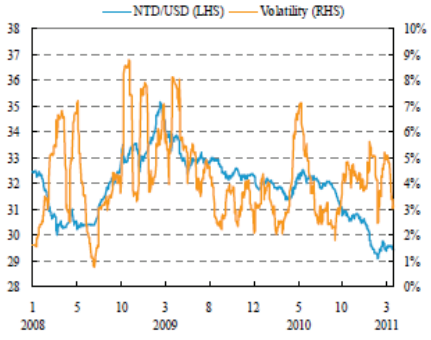
Note: Figure for 2011 is DGBAS forecast.
Source: DGBAS.

Figure 2
Interest Rates in Chinese Taipei



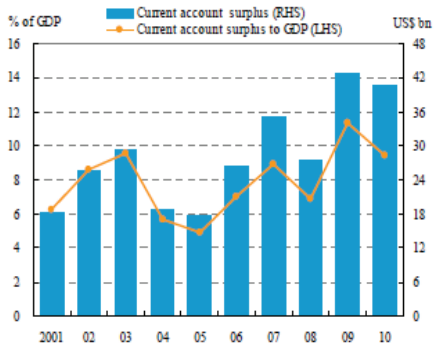
Notes: 1. Interest rate spread = weighted average interest rates on loans - weighted average interest rates on deposits.
2. The weighted average interest rates on deposits and loans exclude preferred deposits of retired government employees and central government loans.
3. Excludes the data of medium business banks.
Source: CBC.

Figure 3
Exchange Rates in Chinese Taipei



Note: Volatility refers to the annualized standard deviation of 20-day daily returns.
Source: CBC.

Figure 4
Current Account Balances in Chinese Taipei



Note: Current account surplus and GDP are annual figures.
Sources: CBC and DGBAS.

1.3 Framework and Performance of PSSs in Chinese Taipei

1.3.1 Framework of PSSs in Chinese Taipei

Since the early 1980s, the CBC has actively participated in the design and management of systemically important payment and settlement systems (SIPSSs) in Chinese Taipei:

- Taiwan Cheque-clearing Houses (TCH) first time adopted Magnetic Ink Character Recognition (MICR) to speed the processing of the bill of exchange in 1985;

- The Financial Information Service Co., (FISC) launched the Shared CD/ ATM system and the Nationwide Interbank Remittance System (NIRS) in 1987;

- The CBC owns and operates CBC-Wire, which consists of the CBC's CIFS in 1995 and the Central Government Security Settlement (CGSS) system in 1997;

- The CBC restructured its CIFS into an all-the-line Real Time Gross Settlement System (RTGS) in 2002;

- The Debt Instruments Depository and Clearing Co. (DIDC) once launched the Short-term Bills Central Depository and Clearing System in 2004; in 2006, the DIDC and the Chinese Taipei Securities Central Depository Co., Ltd. (TSCD) merged and the new entity was renamed as the Chinese Taipei Depository & Clearing Corporation (TDCC) in order to provide book-entry and custody services for the Chinese Taipei Stock Exchange Corporation (TSEC), the centralised listed stock exchange; and the Gre Tai Securities Market (GTSM), the over- the-counter (OTC) quasi-listed stock exchange

- The Mega Bank brought the US$ Bills Clearing and Settlement (UBCS) system into operation in December 2010.

The above PSSs can be classified into three categories: (1) SIPSSs[2] ; (2) retail payment and settlement systems (RPSSs); (3) systemically important securities settlement systems (SISSSs) (see Table 1). They together constitute the framework of payment and settlement systems in Chinese Taipei. All the system construction and configuration are proceeding in proper sequence, matching with the need for economic and financial development.

Among others, the CBC-CIFS acts as a settlement hub of Chinese Taipei's payment systems by linking up the systemically important financial market infrastructures such as: CBC-CGSS; FISC-NIRS; Taiwan Cheque Clearing House - Cheque Clearing System (TCH-CCS); Taiwan Depository and Clearing Corporation – Bills Clearing System (TDCC-BCS); Taiwan Stock Exchange Corporation - Stock Book-Entry Clearing System (TSEC-SBECS); and Gre Tai Securities Market – Electronic Bond Trading System (GTSM-EBTS) (see Appendix 1). Above all, the CBC provides the settlement accounts and final settlement services for the clearing institutions such as TCH, FISC, TDCC, TSEC and GTSM. These arrangements not only favour banks to centralise their liquidity management, but also reinforce safety with non-risk central bank money as their settlement assets.

Initially, the CIFS is an on-line electronic-based fund transfer system operated by the CBC. Through the CIFS, interbank funds transfer can be executed in RTGS mode or in Deferred Net Settlement (DNS) mode across the current accounts that participating banks held at the CBC. Since September 2002, the CBC has reshaped the CIFS into an all-the-line RTGS only system, with a view to improving the payment float problem arising from the DNS. Indeed, the existence of the payment float may expose one party's position to its counterparty so that it also results in potential settlement risks and systemic risk.

Under the RTGS mode, payment orders are processed in a manner of real time and on the basis of transaction-by-transaction. The payment float improves to a certain extent, which implies better efficiency and less risk. However, banks may encounter serious liquidity pressures with the RTGS mode. To streamline the system operation, the CBC introduced some standing facilities into its CIFS system by providing intraday overdrafts, incorporating queue mechanism and executing throughput management.

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2. Following the CPSS Core Principles Report, it is likely that a system is of systemic importance if at least one of the following is true: i) it is the only payment system in a country, or the principal system in terms of the aggregate value of payments; ii) it handles mainly payments of high individual value; iii) it is used for the settlement of financial market transactions or for the settlement of other relevant payment systems.

In centralising large value fund transfers to the CIFS for final settlement, the CBC at first linked the CIFS with the CGSS so that government bond issuances and transactions, principal redemptions and interest payments in the CGSS are now dealt by the CIFS with Delivery versus Payment (DvP) mode. After that, the CBC, in turn, ratified the TDCC, TSEC and GTSM to hold settlement accounts at the CBC and to connect their clearing systems with the CIFS, with a view to realising DvP for those large value transactions in domestic financial markets, such as short-term bills, centralised listed stocks, OTC quasi-listed stocks and fix income securities. These arrangements not only favour banks to centralise their liquidity management, but also increase the settlement security with non-risk central bank money as settlement assets in replacement of the previous commercial bank money. Both the RTGS and DvP mechanisms are designed to address the systemic risk in the large-value securities settlement systems.

Table 1
Configuration of Payment and Settlement Systems in Chinese Taipei

Payment and Settlement Systems		**System Operators**
e-Government	Treasury Proprietary Disbursement Network	MOF
Systemically Important PSSs	CBC-Wire: ♦ CBC's Interbank Fund -transfer System (CIFS) ♦ Central Government Securities Settlement (CGSS)	CBC
	Nationwide Inter-bank Remittance System (NIRS)	FISC
	Cheque Clearing System (CCS)	TCH
Retail PSSs	Interbank Shared Network: ♦ CD/ATM System ♦ EFT/POS System ♦ ATM/Credit/Debit/Pre-paid Cards System ♦ FEDI System	FISC

Payment and Settlement Systems		System Operators
	♦ FXML System ♦ Internet Banking System ♦ Mobile Banking System ♦ Bulk Payment System	
	Automated Clearing House	TCH
	Banks/Post Giro System	Banks; Post
	Regional Shared Exchange Centers for Credit Unions	Credit Unions
	Union Credit Card Processing Center	UCCC
Systemically Important Securities Settlement Systems	Bills Clearing System (TDCC-BCS)	TDCC
	Stock Book-Entry Clearing System (TSEC-SBECS)	TSEC; TDCC
	Electronic Bond Trading System (GTSM-EBTS)	GTSM; TDCC
	Local USD Bills Clearing and Settlement System (UBCSS)	Mega Bank
	Futures and Derivatives Market Settlement System	TAIFEX; GTSM

1.3.2 Performance of Systemically Important Payment Systems in Chinese Taipei

Table 2 shows the transaction statistics about the systemically important financial market infrastructures in Chinese Taipei, including the capital markets such as call loans, short-term bills, bonds, stocks and foreign currencies. As to the transactions of non-cash instruments in Chinese Taipei, their penetration ratios both by value and volume are also given in Appendix 2.

Acting as a large-value interbank fund transferring system, the growth of the CBC-CIFS is very significant both in terms of its annual turnover with respect to real GDP and its average daily transaction value and volume, comparing with the other two systemically important payment systems (SIPSs), a moderate growing FISC-NIRS and a steady declining TCH-CCS. With the centralising of large-value fund transfers to the CBC-CIFS for final settlement in past few years, the daily transaction value of the CIFS is increasingly close to the total value of those financial markets, which registered NT$ 1,434 billion and NT$

1,589 billion in 2011, compared with 568.9 and 999 in 2001 as well as 974.8 and 1992.1 in 2006. Besides, the total settlement of SIPSs (CIFS, NIRS, CCS) grew from NT$250 trillion in 2001 or twenty-six times RGDP to NT$485 trillion, or thirty-three times RGDP.

Table 2
Annual Money Turnover and Average Daily Transaction in Chinese Taipei's SIPSs and Financial Markets

	SIPSSs	CBC-CIFS	FISC-NIRS	TCH-CCS	Call loans	ST-Bills	Bonds	Stock	FX	Total
2001	26.2	568.9	288.8	153.1	46.3	234.1	479.8	74.0	4.7	999.0
2002	26.1	611.4	309.7	127.4	38.6	201.6	535.5	87.1	5.6	1,057.7
2003	26.1	640.4	333.4	112.5	35.0	190.8	811.3	81.0	7.3	1,365.9
2004	28.6	762.4	382.0	104.7	40.2	192.2	811.5	94.0	10.2	1,464.9
2005	31.8	989.1	397.5	96.2	79.4	211.2	1,284.1	75.6	12.1	2,046.9
2006	30.4	974.8	414.3	95.1	95.0	193.4	1,098.9	95.2	15.6	1,992.1
2007	29.6	1,012.0	441.2	90.5	81.3	173.5	779.1	132.7	18.6	1,770.8
2008	31.3	1,120.6	428.8	82.0	66.2	184.1	539.9	104.0	19.4	1,530.6
2009	33.1	1,234.9	375.9	69.9	101.6	166.4	385.6	117.3	16.2	1,290.5
2010	34.0	1,416.7	420.1	75.1	140.2	231.5	420.2	111.5	20.2	1,517.9
2011	32.8	1,434.4	436.0	77.1	131.3	227.8	392.8	105.2	24.2	1,589.2

Note: The numbers in parentheses indicate the volume of transaction.
Source: CBC.

Today's payment systems are growing more interdependent due to common infrastructure and procedure, and thus results in increasing single-point failure. The resilience of a payment system is determined by the weakest part of its components. Business Continuity Planning (BCP) has been aware of an effective vehicle to contain the possibility of single-point failure.

Acting as a competent authority of interbank payment systems, the CBC has urged all the relevant service providers to apply BCP to their daily operation risk management, especially converting delay-control into system performance. For example, the FISC-NIRS shall complete all its daily payment transactions before 16:50; otherwise, it shall apply to the CBC for deferring cut-off time and explain the reason for approval.

Table 3 summarises the delay statistics on the system operation between the CBC-CIFS and FISC-NIRS during 2000-2011. The delay ratio steadily declined from 40.01% in 2000 to 5.62% in 2011. That implies that the system performance has chalked significant improvement over the past few years. Table 3 also identifies some factors that cause the the CIFS system to defer its close-off time. During 2005-2011, most delays are ascribed to out-of-order in software application programmes (95 times); the second one is hardware network/ telecommunication (21 times); the third one is others (16 times) and includes abnormal bank deposit withdrawal, marine cable break due to earthquake, or errors in shifting programmes, etc.; the fourth one is holiday peak effect (9 times)…and so forth. Indeed, the daily operation risk management has made the inter-connection between the CIFS and NIRS system increasingly more efficient.

Table 3
Delay Statistics on Performance of CBC-CIFS/FISC-NIRS

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Business days	275	248	251	251	254	249	251	249	251	253	253	249
Delay days	109	117	70	58	57	39	34	36	27	16	8	14
Delay ratio (%)	40.01	47.33	27.89	23.11	22.72	15.66	13.55	14.46	10.76	6.32	3.16	5.62
Number of Banks that Apply for Deferring Close-off Time (16:50)												
Defer to 17:00	9	12	2	1	0	0	0	0	0	0	0	0
Defer to 17:10	6	7	3	0	1	1	1	2	20	7	8	8
Defer to 17:30	102	136	86	58	51	35	30	22	3	9	0	3
Defer to 18:00	7	12	0	1	2	0	1	2	7	1	0	2
Overdue 18:00	3	8	0	5	9	4	4	12	1	0	0	1
Total	127	175	91	65	64	40	36	38	31	17	8	14

Source: CBC.

Factor Analysis for Deferring close-off time (2005-2011)

Hardware Failure		**Software Failure**	
Abnormal Events	**Times**	**Abnormal Events**	**Times**
Mainframe system	4	Application programs	95
Network & Telecom.	21	Error in shifting program	5
Power apparatus (including UPS)	3	CPU/Database insufficient capacity	5
Hard disk	4	Bill Clearing System	7
Hardware Security Module (HSM)	6	Holiday peak effect	9
Branch-end terminal	7	Others	16

1.3.3 Collaborative Oversight, Risk Management and Standing Facilities

1.3.3.1 Collaborative Oversight Framework

The CBC is entrusted to maintain the sound operation of the PSSs in accordance with the Central Bank, Chinese Taipei Act (CBC Act) as well as the Banking Act.

According to Article 32 of the CBC Act, the regulations governing cheque clearance and settlement of accounts among banks shall be stipulated by the CBC. For that entitlement, the CBC enacts the "Regulations Governing the Administration of Negotiable Instrument Clearing Business by the CBC."

In addition, according to Article 47-3 of the Banking Act, a financial information service business which intends to engage in an interbank fund transfer clearing service shall obtain the competent authority's approval. If such a business also involves large-value fund transfer clearing, the approval of the CBC is also required.

With the legislation of the "Organic Act to Establish Financial Supervisory Commission (FSC) Under Executive Yuan" (The FSC Act), issued by Executive Yuan on 23 July 2003, the FSC acts as an additional competent authority for the payment systems in Chinese Taipei. According to that legislation, the payment system oversight in Chinese Taipei is entrusted to both the FSC and the CBC, with the purpose of forging Chinese Taipei ahead on a two-peak mode with collaboration and specialisation.

The CBC has the rights to revise the relevant rules and regulations, such as "Directions for the Central Bank of ROC to Govern Electronic Interbank Fund Transfers and Settlements" (The EFT Directions), with an additional chapter on the management of clearing institutions.

Under the collaborative framework, the CBC and the FSC are respectively charged with the enforcement of the following rules and regulations:

- Rule of CBC Governing Bills and Exchanges;
- Rule Regulating the CBC Interbank Fund Transfer Operation;
- Rule Regulating Credit Card Services (FSC);

- The Master Agreement of PC and Network Banking Activities (FSC);
- The Security and Management of the Criteria for E-Banking of Financial Institutions (FSC)
- Guideline Governing the Establishment and Management of Interbank Payment Service Providers (FSC)

1.3.3.2 Risk Management

The CBC-Wire is owned and operated by the CBC. With the CBC-Wire, the CBC carries out its reserve requirement adjustments, discount window, and open market operation, Besides, it offers final settlement for those portfolio transactions arising from the money markets, securities and equity markets, and foreign exchange markets.

The CBC-Wire is composed of the CIFS and CGSS, of which the CIFS is a RTGS, functioning as a large-value fund transfer system across participating banks; while the CGSS is a book-entry system with DvP settlement for government bond transactions. Both the RTGS and DvP mechanism are designed to address the systemic risk in the large-value payment systems.

To assist the FISC-NIRS in smooth operation, the CBC permits banks to open a pool account in name of the "Guarantee Account for Interbank Clearing Services" so as to warrant every interbank net clearing payment dealt by the FISC-NIRS. In addition, the Bank ratifies the TSEC and GTSM to open settlement accounts and to connect their clearing systems with the CIFS in order to deal with the final settlement of net clearing balances resulting from financial market transactions with respect to the TSEC-listed stocks, GTSM-quasi-listed stocks and bonds. These arrangements not only favour banks to centralise their liquidity management, but also increase the settlement security with non-risk central bank money as settlement assets in replacment of commercial bank money.

In July 2000, the GTSM introduced the Electronic Bond Trading System (EBTS), providing bond dealers an online trading platform, different from the price negotiations conducted via phone. The EBTS significantly improved trading efficiency and thus substantially increased the volume of outright transactions. It was an important progress in Chinese Taipei's bond market. Moreover, the Ministry of Finance, the CBC and bond market supervisors have continued to introduce measures regarding the improvement of bond issuance, trading and settlement. These included the introduction of a regular and moderate issuance

system, reopening system, when-issued trading system, primary dealer system and lending facility for government bonds, the establishment of a corporate bond and financial debenture trading platform, as well as the opening of new bond-related financial products. They also introduced a DvP mechanism for book-entry security transactions in order to reduce the settlement risk in the bond markets.

1.3.3.3 Standing Facilities

In response to the increased demand for liquidity on account of implementing the RTGS and in order to streamline the system operation, the CBC took the following supplementary actions:

(1) Provide Intraday Overdrafts: Employing pledges backed with eligible collaterals, such as central government bonds, treasury bills and CBC Certificates of Deposits (CDs) financial institutions may apply to the CBC for liquidity accommodation with a view to settlement. To avoid potential abuse, an intraday overdraft is calculated by multiplying the amount of the overdraft with the time span of the credit extension (measured by minutes), and the CBC may charge this liquidity accommodation according to its Accommodation Rate with Collateral. Once a certain intraday overdraft is not refunded by a participating financial institution by the deadline, such that it must be carried over to the next business day, the CBC may begin to charge this financial institution a penalty interest rate, which is calculated by multiplying the amount of the un-refunded overdraft with the time span of the credit extension in terms of 1.2 times the CBC's Accommodation Rate without Collateral. If the un-refunded overdraft is carried over to the next business day, the penalty interest rate shall be doubled, and the CBC, starting from the third business day, may suspend this default financial institution's access to an intraday overdraft temporarily. If a financial institution has its intraday access suspended by the CBC twice within a year, this bank will have its qualification to apply for the intraday overdraft function called to a halt for a certain period.

(2) Incorporate Queuing Mechanism: Once a payment order is initiated by a participating institution with insufficient account balances to cover it, the payment order will temporarily be held by the queue system according to its priority, which may fall into four categories of interbank transactions: (1) financial institutions' accrued funds payable to the CBC; (2) financial institutions' accrued bills of exchange payable, accrued net bills of exchange payable, and funds transfers to the CBC's Guarantee Account, or for

securities settlements to the CBC's Guarantee Account for Interbank Clearing Businesses; (3) financial institutions' forward payments to refund call loans at maturity; and (4) interbank funds transfers or other payments. The system mechanism is designed to keep payment orders in the queue line until the deficiency of current accounts is made up in order to avoid inputting payment orders repeatedly. The queue system adopts the principle of By-pass FIFO (first in, first out) to handle payment orders according to their priority ranks, i.e., for the same category, payment orders are executed in the manner of first-in-first-out and by-pass. If the available balance is not sufficient to settle the next payment order, the latter ones will simply be moved forward to be executed. Only when all payment orders of the same category are settled will the execution be moved to the next category. When the system runs to close off, all payment orders with insufficient available balances that are still held in the queue line will be revoked by the system directly.

(3) Execute Throughput Management: To control the daily flow of payment orders on the CIFS, the CBC has stipulated throughput ratio requirements so as to avoid deferring payments and thereby affecting participants' funding schedules. According to the required throughput ratio, all banks shall finish their daily transaction value by at least 50% (30% for bills finance companies) no later than 14:30, and at least 80% (for both banks and bills finance companies) no later than 16:30.

2. Literature Review

2.1 Framework of PSS, MP and FS Inter-position

The modern monetary economy can be presumed as an physical organ[3], which is composed of the PSSs, the financial intermediation, and the fractional reserve banking system (include central banking) with each function contributing to discharge payment duties between creditor's rights and debtor's obligations, bridge the saving and the investment, and maintain price and financial stability accordingly.

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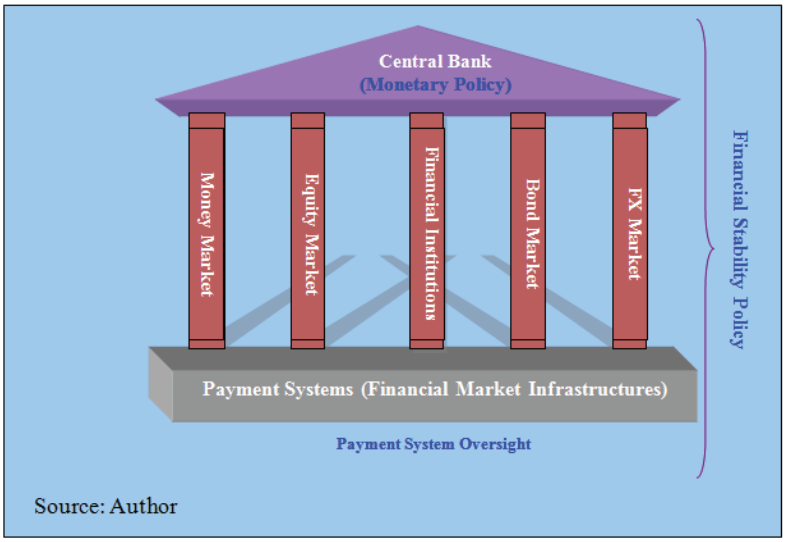
3. Kiyohiko G Nishimura, Deputy Governor of the Bank of Japan, once gave a speech to compare the payment system to the blood circulatory system at the Bank of Korea International Conference, Seoul, on May 26, 2011. His figure of speech says: While the infrastructure making financial contracts is straightforward and smooth could be compared to arteries pumping out blood into the body of the economy, the payment and settlement system would then be the veins carrying the blood back to the heart.

The recent financial crises remind many economists and central bankers to re-think central banking when confronting increasingly future uncertainty (Eichengreen, 2011), then did they focus on the relationship among the payment system, the financial stability and the monetary policy. Such an interactive position can be described as Figure 5, which looks like a bourse constituted by the roof (central bank), the pillars (financial institutions) and the floor (financial market infrastructures) together. The bourse may not work smoothly if each component is out of order or experience disruption, because they are closely interdependent to one another. On the other hand, both banks (include central banks) and financial markets cannot function well without a sound financial market infrastructure.

Figure 5
Interposition among PSS, MP and FS



By transferring money between payers and payees, the payment system builds a bridge between money and real economic activities. Acting as a transmitting channel for day-to-day monetary policy implementation, the payment system is also associated with the financial stability because financial instability can be transmitted through the payment system at a speed limited only by the speed of the payment system itself. Both monetary and financial stabilities provide further grounds for central banks to exercise oversight of payment systems, even if not active involvement.

(1) **Payment systems and monetary policy are closely intertwined**. A speedy and well-functioning payment system is a prerequisite for the smooth transmission of monetary policy. The central bank is dependent on safe and efficient large-value payment systems of the banking industry and financial markets, which are able to execute its open market operation, say, a securities repurchase agreement on a same-day basis, in order to implement its interest rate and/or liquidity policies. Disruptions in payment systems can quickly have a negative impact on the national financial markets, and can be an impediment to the development of the real economy. Based on this reason, many central banks in the advanced countries are empowered with oversight of payment system, supervision of banks, and/or surveillance of financial market (Deutsche Bundesbank, 1997).

(2) **Payment systems build the cornerstone for financial stability**. A safe and efficient payment system contributes to the maintenance and promotion of financial stability and economic growth. However, it concentrates risks if it is not properly managed. As a consequence, it can be a source of financial shocks, such as liquidity dislocations and credit losses. Particularly in the large-value payment system, the settlement failure of one participant may cause other participants to be unable to meet their obligations when due. Such a systemic risk may have a domino effect, and can quickly spread throughout the financial system as a whole. The central bank's RTGS arrangement and the intraday liquidity facility are developed to address the systemic risk; it turns out to be an effective tool for the smooth functioning of monetary transmission, and in turn, contributing to the financial stability (Fry et al., 1999).

(3) **Financial stability per se is broader concept of monetary policy**. Price stability to some extent is in favour of financial stability. For all that, there is as yet no universally accepted definition of financial stability. Defined positively, "financial stability" can be thought of in terms of the financial system's ability to: (i) facilitate an efficient allocation of economic resources both spatially and inter-temporally; (ii) assess and manage financial risks; and (iii) withstand adverse shocks. From a negative view, "financial instability" refers to the occurrence of currency, banking, or foreign debt crises, or inability of the financial system to absorb adverse shocks (endogenous or exogenous), and allocate resources efficiently, with the result that it cannot facilitate real economic performance in a sustained manner (CBC, 2008).

The key to ensure that the linkages among the payment system, monetary policy and financial stability are not disruptive lies in regular contact and information-sharing among those responsible for the payment system, monetary policy, banking supervision, and financial markets surveillance. This is particularly important when major operational changes are contemplated and when markets and systems are under strain. With close cooperation and coordination, policies consistency and transparency together form and result in reliable payment systems, in which risks/obligations are managed prudently. At least, there should be opportunities to prevent settlement risks developing into financial crises.

2.2 Theory of PSS, MP and FS

2.2.1 Pre-crisis Intraday Liquidity Policy

The monetary policy theoretically is based on the quantity theory of money, which assumes that the payment behaviour is fixed or determined by market convention, so the relation between the demand for money balances and its determinants is a fundamental building block in most theories of macroeconomic behaviour and is a critical component in the formulation of monetary policy. The central bank has the obligation of controlling money supply to meet the demand for money. Under this policy framework, a monetary target approach mainly focuses on the control of base money first, then monetary aggregates, finally the output and inflation. Another inflation target approach focuses on the determination of short-term interest rates and directly targets inflation stabilisation only.

The shift in monetary policy emphasis from direct controls on interest rates and credit to indirect management of commercial banks' reserves and liquidity through open market operations once served to emphasise the critical importance of reliable and efficient same-day payment and settlement arrangements. Such arrangements mainly aim at managing the payment float arising when the accounting entries for the two sides of a payment order are not posted simultaneously. Where there is a large and variable payment float, there exists uncertainty in the final settlement process. The intraday liquidity policy is then developed to contain such a settlement uncertainty, involving intraday credit/ overdraft/repo facilities to speed the payment flow throughout the payment systems.

Among others, an interbank fund transfer system used for the settlement of financial market and other large-value transactions, will offer substantial benefits for monetary policy implementation. It can also contribute to the

maintenance of the stability of the financial systems (IMF, 1994; Johnson et al., 1998). These benefits include:

- The elimination of float arising from these transactions, thus reducing erratic fluctuations in bankers' balances with the central bank, and making it easier to forecast their levels accurately;

- The effective operation, at a low cost, of an interbank money market, in which banks and other financial institutions can efficiently manage their daily liquidity requirements, and in which the central bank can conduct precisely targeted open market operations;

- The elimination of credit exposures between banks and the reduction of their liquidity exposures, arising in the settlement of their transactions and those of their customers;

- The opportunity for banks to maintain a lower stock of overnight balances with the central bank; and

- The ability to reduce or eliminate settlement risk arising from transactions in other financial markets, such as for securities or for foreign exchanges.

With this in mind, the payment system not only serves as financial market infrastructure (FMI), but it also enters into the very heart of decision making in monetary policy (Crockett, 1998)[4].

Even when the payment float is not a problem because it is either stable or minimal, no discussion of payment system/monetary policy linkages is complete without some mention of the possibility of a spillover of intraday credit into overnight credit, and the potential effect of such an event on the overall monetary conditions. For all that, central banks can introduce safeguards such that the spillover effect is negligible. In other words, intraday/interday (overnight) markets can be effectively segmented by imposing collateral arrangements and a penal regime for any "spillover" lending. Hence, monetary policy can still operate effectively in the context of end-of-day balances and overnight (or longer) interest rates (Fry et al., 1999).

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4. Andrew Crockett (1998) once pointed out that the BIS Committee on Payment and Settlement Systems was transformed into a senior-level body in 1990 after a growing realisation that "payment systems were not only a technical matter but also went to the very heart of the central bank policy concerns."

In practice, among many central banks, it is general accepted that: (i) Part of the reserves account balances are allowed for settlement use; (ii) Many central banks provide intraday credits/repo on the ground of RTGS system efficiency; (iii) Relevant support facility: collateral arrangements, interest charges, penal regime; (iv) Accommodation through intra/inter call loan markets (see Table 4), where we find intraday liquidity accommodation is mainly provided by the central bank, instead of by the market, either against collaterals or for a penalty charges. Except Switzerland and Japan, most countries listed in Table 4 are lacking in intraday money market. In addition, most central banks do not charge interest on intraday credit except USA and Chinese Taipei. People may ask why distribution of intraday liquidity through a market was seldom adopted as a common practice. This issue then concerns the role of the intraday market.

Table 4
Comparative Analysis of Intraday Credit Policies for Selective Economies' RTGS Systems

	Be	Fr	Ge	It	Ne	Swd	Sws	UK	USA	Ca	Ja	Tw	HK	Si
Access to required reserves for payment purpose	**Y**	**Y**	**Y**	**Y**[1]	**Y**	**nap**	**Y**	**nap**	**Y**	**nap**	**Y**	**Y**	**nap**	**Y**[1]
Access to liquidity reserves for payment purpose	**nap**	**nap**	**nap**	**nap**	**Y**	**nap**	**Y**	**Y**	**nap**	**nap**	**nap**		**nap**	
Intraday credit provided by central bank	**Y**		**Y**	**Y**	**Y**	**Y**			**Y**[3]	**Y**	**Y**	**Y**		**Y**[2]
Quota Limited				y		y			y	y				
Collateral Pledged	y		y	y	y	y			y	Y	y	y		y
Interest charge									y			y		
Intraday repo operated by central bank	**Y**	**Y**				**Y**[4]	**Y**	**Y**		**Y**			**Y**	
Interest charge														
Overnight liquidity accommodated by central bank	**Y**	**Y**	**Y**	**Y**	**N**[5]	**Y**	**Y**	**Y**[6]	**Y**	**Y**	**Y**[6]	**Y**	**N**[5]	**Y**

Charge overnight interest rate/Lombard rate	y	y	y	y		y	y	y	y	y	y	y		y
Penalty charge	y	y	y	y		y	y	y	y	y	y	y		y
Lag surcharge								y		y	y	y		
Accommodation through money market			**Y**			**Y**	**Y**[7]			**Y**	**Y**[7]			**Y**
Intraday call loan market							y				y			
Interday call loan market			y			y				y				y

Source: Compiled by Author According to CPSS LVPS Report (Appendix 1) May, 2005.

Notes:

1 Italy allows no more than 12.5% balances in reserves accounts to afford payments; Singapore 3%.

2 Whether or not Singapore provides intraday credit and requires collateral pledge depends on cases.

3 FedWire carries out credit rating and divides participants into six classes on which intraday credit quota depends, interest charges at discriminated cost in accordance with/without collaterals.

4 Not standing facility.

5 At the end of business day, central bank will automatically transfer fund in order to square the net debit positions in all RTGS accounts.

6 BOE charges intraday credits that are not able to refund after business hours by penalty fee 2.5~5 percentage points, depending on first or repeated offender; BOJ has similar regulation.

7 In Japan, intraday call loan market developed to support BOJ's DNS settlement. In Switzerland, it is used to accommodate specific securities transactions.

Typically, intraday liquidity can be obtained directly from the central bank. In contrast, overnight liquidity is usually made available to banks through a market. Martin & McAndrews (2007) discuss the separate roles of intraday and overnight markets and argue that an intraday market can be organised in the same way as the overnight market, if banks' deposit reserves are paid interest by the central bank or the marginal cost of overnight liquidity is zero, in another word, the opportunity cost of money is close to zero. Even so, this kind of intraday market may be feasible, but does not necessarily mean it is desirable. In all, the *Economist* [5](2001) once indicated, "[Banks] like to hang on to their cash and deliver it as late as possible at the end of the working day". To deal with this problem, intraday liquidity accommodation is the key, whatever it may come from central banks or markets; and it would be better to distinguish intra/inter liquidity markets

5. See "The Long Shadow of Herstatt," The Economist, April 14, 2001.

so that intraday market is mainly used for settlement purpose, while overnight market is used for monetary policy implementation.

2.2.2 Post-crisis Thinking on Monetary Policy Strategy

During the past few years, the world economy underwent from "Great Moderation" to "Once-in-a-century Credit Tsunami", this makes many economists and central bankers bug-eyed. Spaventa (2009) first casted doubt on economists and economics: Does economic theory suffer from essential deficiencies? Or, economists cannot see around corners, neither are they perspicacious but helpless.

In the pre-crisis period, there was a general consensus among academic economists and central bankers about the science of monetary policy strategy, whereby monetary policies were formed in an economic environment full of market uncertainty and imperfect information. In general, the strategic thinking involves a set of target objectives, policy instruments, particular procedures and general rules, so as to ensure policy effectiveness, consistency and sustainability (Mishkin, 2010).

The global financial crisis has taught us to question our beliefs about the way we conduct monetary policy, and broader financial stability strategy. Blanchard et al. (2010) once reviewed the main elements of the pre-crisis consensus on macroeconomic theory, and identified what we learned from the 2007-2009 financial crises and what tenets of the pre-crisis framework may still hold. In Table 5, Blanchard summarises the comparison of macroeconomic stability policies in pre- and post-crisis. Among others, one important implication from this comparison indicates the following: monetary policy, especially the inflation target approach, dominated fiscal policy and financial regulation in the "Great Moderation"; however, coping with economic downturn, monetary policy becomes fatigue, instead fiscal and financial stabilisers become more powerful, and three policy tools shall be considered together during the whole boom-bust cycle.

Table 5
Comparison of Macroeconomic Stability Policies

Pre-crisis Consensus	Lessons from Crisis	Implication for Policy Design
The Great Moderation	Reinterpreting the Great Moderation	Designing Better Automatic Fiscal Stabilisers
Set Inflation at 2% around	Low Inflation Limits the Scope of MP in Deflationary Recessions	Combining Monetary and Regulatory Policy
One Target: Stable Inflation	Stable Inflation May be Necessary: But it is Not Sufficient	Should the Inflation Target be Raised?
One Instrument: Policy Rate	Financial Intermediation Matters	Inflation Targeting and Foreign Exchange Intervention
A Limited Role of Fiscal Policy	Countercyclical Fiscal Policy is an Important Tool	Creating More Fiscal Space in Good Times
Financial Regulation: Not a Macroeconomic Policy Tool	Regulation is not Macro-economically Neutral	Providing Liquidity More Broadly

Source: IMF Staff Position Note, Feb. 12, 2010.

Before the global financial tsunami, most economists and policymakers thought of monetary policy as having one target, inflation, and one instrument, the policy rate and the Tinbergen Rule holds[6]. So long as inflation was stable, the output gap was likely to be small and stable, and monetary policy did its job. But the crisis has made it clear that the policymakers have to watch many

6. The Tinbergen rule states that if the number of policy targets surpasses the number of instruments, then some targets may not be met. See Jan Tinbergen (1952), *On the Theory of Economic Policy* (Amsterdam: North-Holland).

targets, including the composition of output, the behaviour of asset prices, and the leverage of different agents. It has also made clear that they have potentially many more instruments at their disposal than they used before the crisis. The challenge is to learn how to use these instruments in the best way, because the Tinbergen Rule may not still hold if there exist objective frictions among multiple targets at the same time.

The most important lesson of the global crises is that: price stability is no longer separable from financial stability, and it is systemic risk that the central bank and the regulatory authority should pay much closer attention to than before. Systemic risk is a complex function of all sorts of linkages, arising from cross-correlated and pro-cyclical asset prices, market frictions, and interconnectedness, and such like. This is what makes the role of the central bank in managing systemic risk essential.

At the most basic level, of course, control of systemic risk will require strong prudential oversight of individual financial institutions and markets. But that is not enough. A shock in an isolated financial market or in the real sector can quickly spill over into another, and in the process be dramatically amplified. For this reason, systemic risk control should be approached from a macro-prudential perspective in which the real and financial sector linkages take center stage (Bank of Korea, 2012).

2.2.3 Intraday Liquidity Management

RTGS systems eliminate the settlement risk from unwinding because payments are settled irrevocably, and with finality, on an individual gross basis and in real time. However, the elimination of settlement risk comes at the cost of an increased need for liquidity to smooth non-synchronised payment flows. Since 2008, the Basel Committee on Banking Supervision (BCBS) has issued a series of reports on intraday liquidity management. Some of the key points of which are summarised below:

(1) The BCBS (2008) published the "Sound Principle Report" of which Principle 8 identifies six operational elements that should be included in a bank's strategy for managing intraday liquidity risk, and indicates that a bank should:

- Have the capacity to measure the expected daily gross liquidity inflows and outflows, anticipate the intraday timing of these flows where possible, and forecast the range of potential net funding shortfalls that may arise at different points during the day;

- Have the capacity to monitor intraday liquidity positions against the expected activities and available resources (balances, remaining intraday credit capacity, available collaterals);

- Arrange to acquire sufficient intraday funding to meet its intraday objectives;

- Have the ability to manage and mobilise collaterals as necessary to obtain intraday funds;

- Have a robust capability to manage the timing of its liquidity outflows in line with its intraday objectives; and

- Be prepared to deal with unexpected disruptions to its intraday liquidity flows.

(2) The BCBS (2010) published the "*Basel III Liquidity Rules Report*", which sets out two new minimum liquidity standards: the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR). Although the LCR is designed to promote the short term resilience of a bank's liquidity risk profile, currently, it does not include intraday liquidity within its calibration[7].

(3) The BCBS (2012) published the "*Monitoring Indicators Report*", which proposed a set of indicators and four scenario stress tests aiming to provide supervisors with sufficient information on intraday liquidity risks or on how well the risks are managed.

Indicators

The indicators are:

- Daily Maximum Liquidity Requirement
- Available Intraday Liquidity
- Total Payments
- Time-specific and Other Critical Obligations
- Value of Customer Payments Made on Behalf of Financial Institution Customers

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7. The Basel III liquidity rules states: Banks and regulators should be aware that the LCR stress does not cover expected or unexpected intraday liquidity needs that occur during the day and disappear by the end of the day. The Committee is currently reviewing if and how intraday liquidity risk should be addressed.

- Intraday Credit Lines Extended to Financial Institution Customers
- Timing of Intraday Payments
- Intraday Throughput

Scenario Stress Tests

- Own financial stress: A bank suffers, or is perceived to be suffering from, a stress event.
- Counterparty stress: A major financial institution counterparty suffers an intraday stress event which prevents it from making payments.
- Customer stress: The customer bank of a correspondent bank suffers a stress event.
- Market-wide credit or liquidity stress.

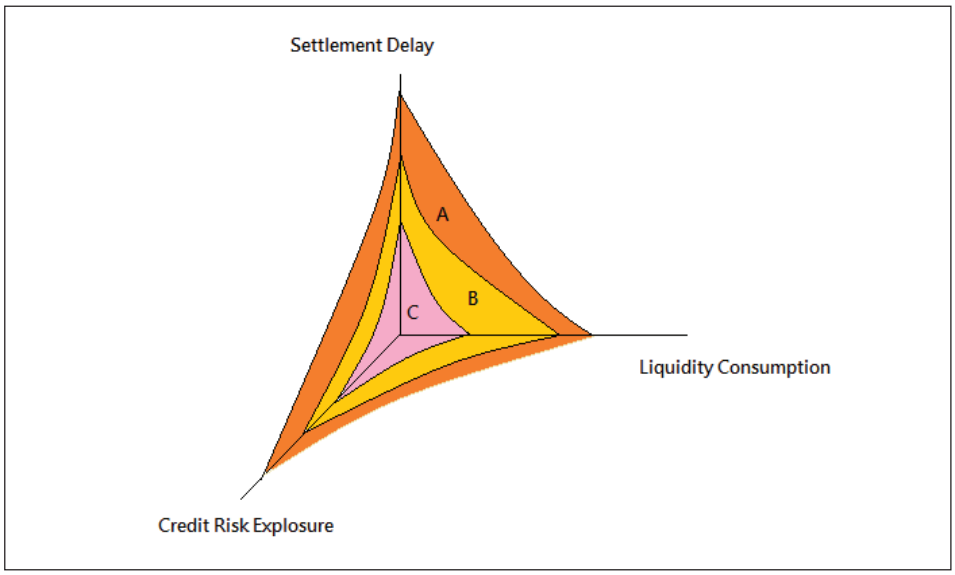
2.3 Implication of Safe and Efficient SIPS to MP and FS

A safe and efficient large-value interbank fund transfer system may contribute to ensure the quality of currency in circulation, and support financial institutions and markets to reduce transaction cost, speed up the payment cycle and control their liquidity positions. Progressing with the electronic fund transfer penetration and the standardisation of the transaction platform, such a development largely raises inter-operability and functional complementarities across payment systems, and creates significant economies of scale, besides the network externality effects. Based on the consideration of public interests (safety and efficiency), most governments vest such a payment system with natural monopoly power (Bergman, 2003). In general, a single financial market infrastructure for large-value interbank payment system has advantage of technical efficiency due to unified system specification and operating standard, including common message format and inter-operative application programmes. Open competition in this field of market may instead result in operational complexity among multi-systems and inefficiency. The characteristic of such a SIPS is of special implication to MP and FS, because it is not only too big to fail, but also too connected to fail.

The Bank of Finland (2005) once applied indicators - settlement delay, credit risk exposure and liquidity consumption - to measure system efficiency (see Figure 6). The system structure will be more efficient when it is closer to the origin. Since individual agent's behaviour is often subject to resource constraint and risk preference, there usually exists trade-off relationship among the target variables. In general, increasing liquidity consumption, settlement risk exposure, or both, can increase settlement speed (or improve settlement delay). On the

other hand, given fixed throughput capacity, intending to reduce settlement failure risk, the only method need consume more liquidity but at the cost of increasing interest payment. Similarly, given fixed liquidity resources, the only way to improve settlement speed must allow more settlement risk taking. However, technological advance and payment innovation may raise overall system efficiency, such as A moves to B and B moves to C.

Figure 6
Efficiency of Payment and Settlement Systems



Source : Bank of Finland (re-edited by author).

3. Assessment of Payment Systems Based on the CPSIPS

3.1 The CPSS-IOSCO PFMI Assessment Methodology

The Committee on Payment and Settlement Systems – International Organisation of Securities Commissions (CPSS-IOSCO) (2012) jointly issued the **"***Principles for Financial Market Infrastructures"* (PFMIs) to replace their previous reports:

(1) CPSS's "*Core Principles for Systemically Important Payment Systems"* (CPSIPS), issued in January, 2001;

(2) CPSS-IOSCOs' "*Recommendations for Securities Settlement Systems"* (RSSS), issued in November, 2001; and

(3) CPSS-IOSCOs' "*Recommendations for Central Counterparties"* (RCCP), issued in November, 2004.

The principles in the PFMI report harmonise and strengthen the existing international standards for payment systems (PSs), central securities depositories (CSDs), securities settlement systems (SSSs), and central counterparties (CCPs). The revised standards also incorporate additional guidance for OTC derivatives, CCPs and trade repositories (TRs). In addition to the standards for FMIs, the report outlines the general responsibilities of central banks, market regulators, and other relevant authorities for FMIs in implementing these standards.

The main public policy objectives of the CPSS and the IOSCO in setting forth these principles for FMIs are to enhance safety and efficiency in payment, clearing, settlement, and recording arrangements, and more broadly, to limit systemic risk and foster transparency and financial stability.

At the same time as publishing the final version of the PFMI, the CPSS and IOSCO have issued two related documents for public consultation, namely an "*assessment methodology*" and a "*disclosure framework*" for these new principles. After the consultation period, the CPSS and IOSCO will review the comments received and publish the final versions of the two documents later in 2012. In light of this, the CBC has formed a Task Force to study the aforesaid three documents in detail, and embark on drawing an "action plan" to assess our SIPSs according to PFMI in the forthcoming year, but not now.

3.2 World Bank-IMF IOSCO-ROSC Assessment Methodology

Not until today, almost all countries followed the World Bank-IMF's Financial Sector Assessment Programme (FSAP) to assess the vulnerabilities and development needs in their financial sectors, including payment systems. The FSAP is designed to help countries enhance their resilience to crises and to foster growth by promoting financial stability and financial sector diversity. This programme basically looks to:

- Identify strengths, vulnerabilities and risks of the financial system;
- Ascertain the sector's development and technical assistance needs;
- Assess the observance and implementation of relevant international standards, codes and good practices;
- Determine how key sources of risk and vulnerabilities are being managed; and
- Help prioritise policy responses.

Through the FSAP, country authorities can be involved in stress-test modeling, comparing their risk management systems with those in other countries, and benchmarking their regulatory and supervisory structures against other countries. The assessment process, therefore, increases the country authorities' capacities to oversee and strengthen their financial sectors.

The assessment of observance of the CPSS's CPSIPS has been listed as part of the World Bank-IMF's FSAP. Two main documents are prepared as part of the CPSIPS assessment: (i) *Report on the Observance of Standards and Codes* (ROSC); and (ii) *Detailed Assessment*. The objective and the scope of the assessment mainly focus on the SIPSs. The factors used to identify the SIPSs should be clearly indicated.

Using a descriptive style, the assessor should state the main findings of the assessment of observance of the Core Principles under the following main groupings: Legal Framework (CP I); Understand and Management of Risks (CP II–III); Settlement (CP IV–VI); Operational Reliability and Efficiency (CP VII–VIII); Access and Governance (CP IX–X); and Central Bank Responsibilities (Resp. A–D). The summarised assessment must bring out the main aspects of the strengths and weakness.

The CBC had assessed its CIFS system in applying the CPSS's Core Principles during 2007-2008. At the same time, it also pushed the TCH and FISC to self-assess their Cheque Clearing System (CCS) and NIRS, respectively,

according to the CPSS's Core Principles and submit their self-assessment reports to the CBC for screening during 2008-2009.

However, from today's view, the assessment results seem out of date, because each system has since made extensive improvements under the CBC's oversight. The CBC authorities think it would be better to submit new assessment results that follow CPSS-IOSCO's PFMI methodology in the future, so the new assessment results are not available for the moment.

4. Policy Implication

Once upon a time, the PSS was deemed as no more than an accounting process and a downstream back-office subordinate to the banking business units that took responsibility for monetary policy or financial stability. Over the past two decades, the PSS has evolved into an independent business function, along with monetary policy and financial stability, and together they form the core mandates of the central bank.

Likewise, in the past two decades, financial and fiscal stability once took a backseat to monetary policy until the outbreak of the global financial crisis, which has taught us to question our beliefs about the science of monetary policy strategy. In general, the strategic thinking involves a set of target objectives, policy instruments, particular procedures and general rules, so as to ensure policy effectiveness, consistency and sustainability. Conventional monetary policy has one target - inflation, and one instrument - the policy rate; and assumes that the Tinbergen rule holds. However, a new consensus emerges from the recent financial crisis, that is, price stability is no longer separable from financial stability, and the Tinbergen rule may not hold if there exists target friction between monetary and financial stabilities. With this lesson in mind, central bankers shall find an effective solution to harmonise their objectives in monetary policy, financial stability and/or payment systems, and together the three are of equal importance.

Theoretically, the linkage between payment systems and monetary policy depends on the design and management of the intraday liquidity facilities/markets; while the linkage between payment systems and financial stability depends on the settlement arrangements – DNS, RTGS or both. Both settlement arrangements and intraday liquidity facilities aim at solving the payment float uncertainty from which hides potential settlement risk and financial instability.

For example, an accidental default payment in the DNS system may unwind other successful payments and result in settlement risk and system gridlock, or more serious, even cause systemic contagion and amplification effect through the inter-connected payment systems. The RTGS systems eliminate the settlement risk from unwinding; however, the elimination of settlement risk comes at the cost of an increased need for intraday liquidity to smooth non-synchronised payment flows. So, intraday liquidity management and risk control play a critical role in smoothing the RTGS system operation.

In practice, the major part of intraday liquidity is provided by central banks by means of collateral pledge or repos open market operation, accompanying with incentive mechanism, such as interest charges or penalty. The rest are accommodated from intra/inter call loan markets. To avoid a spillover effect into the overnight market, the intraday credit shall be totally refunded before the end of business day, otherwise, penalty fees will be charged. The fact is clear that intraday liquidity is only used for settlement purpose, and it is better to segregate intraday market from interday market, which is used for policy transmission. That implies that a policy mix is required if central bankers try to link payment systems with monetary policy.

Last but not least, most SIPSSs are characterised by natural monopoly power; they are of special significance to monetary policy and financial stability, because they are not only too big to fail, but also too connected to fail.

5. Conclusion

5.1 Need an Advanced Study on the Inter-linkage among PSS, MP and FS

In the past, payment services are subordinated to banking services and are charged therein. In Chinese Taipei, payment services and relevant revenues for some banks accounted for 10% ~ 13% of total revenues. This fact indicates payment services are not subordinated to banking services any more.

In payment systems, one bank's payment is another bank's liquidity. A failure to transfer funds for whatever reason can lead to similar failure by other system participants who are relying on these payments. Even those not directly involved with the bank experiencing the original failure may be affected. Failure to meet payment obligations will lead quickly to loss of confidence and reappraisals of credit-worthiness, both among the community of payment system banks and, more widely, among the financial market participants.

Payment systems not only represent a potential source of systemic disturbance in them but also have the potential of transmitting financial shocks and problems from their initial source to other parts of the financial system – and even to magnify them. So market rumours about one bank's credit-worthiness can encourage other banks to delay sending payments to it until they received the expected payments in advance.

Conventional monetary policy targeted a single objective of price stability, which is assumed to encompass financial stability. The global financial crisis proved that price stability may not warrant financial stability, because the two objectives occurred in dilemmatic friction. Central bankers shall find an effective solution dealing with the problem of target friction if payment systems, monetary policy and financial stability are together considered in their policy making.

5.2 Close Watch on New Development in Liquidity Risk Management

In light of the liquidity dry-up during the financial crisis of 2007–2009, the BCBS (2008) suggested that "A bank should actively manage its intraday liquidity positions and risks to meet payment and settlement obligations on a timely basis under both normal and stressed conditions and thus contribute to the smooth functioning of payment and settlement systems."

To complement these principles, the BCBS has further strengthened its liquidity framework by developing two minimum standards for funding liquidity since 2010. One is the LCR, aiming to promote the short-term resilience of a bank's liquidity risk profile by ensuring that it has sufficient high-quality liquid assets to survive a significant stress scenario lasting for one month. Another one is the NSFR, aiming to promote resilience over a longer time horizon by creating additional incentives for banks to fund their activities with more stable sources of funding on an ongoing basis. The NSFR has a time horizon of one year and has been developed to provide a sustainable maturity structure of assets and liabilities.

According to the BCBS (2012), banks shall be required to report the amount of intraday liquidity available to them at the start of each business day and the lowest amount of available intraday liquidity by value on a daily basis throughout the reporting period.

A secure, efficient and reliable payment system shall warrant currency value as of high quality and strengthen market trade confidence in favour of consumption and investment. With this in mind, the CBC shall closely watch the new development of monitoring indicators and stress tests on the intraday liquidity risk management, in addition to the Basel III liquidity rules.

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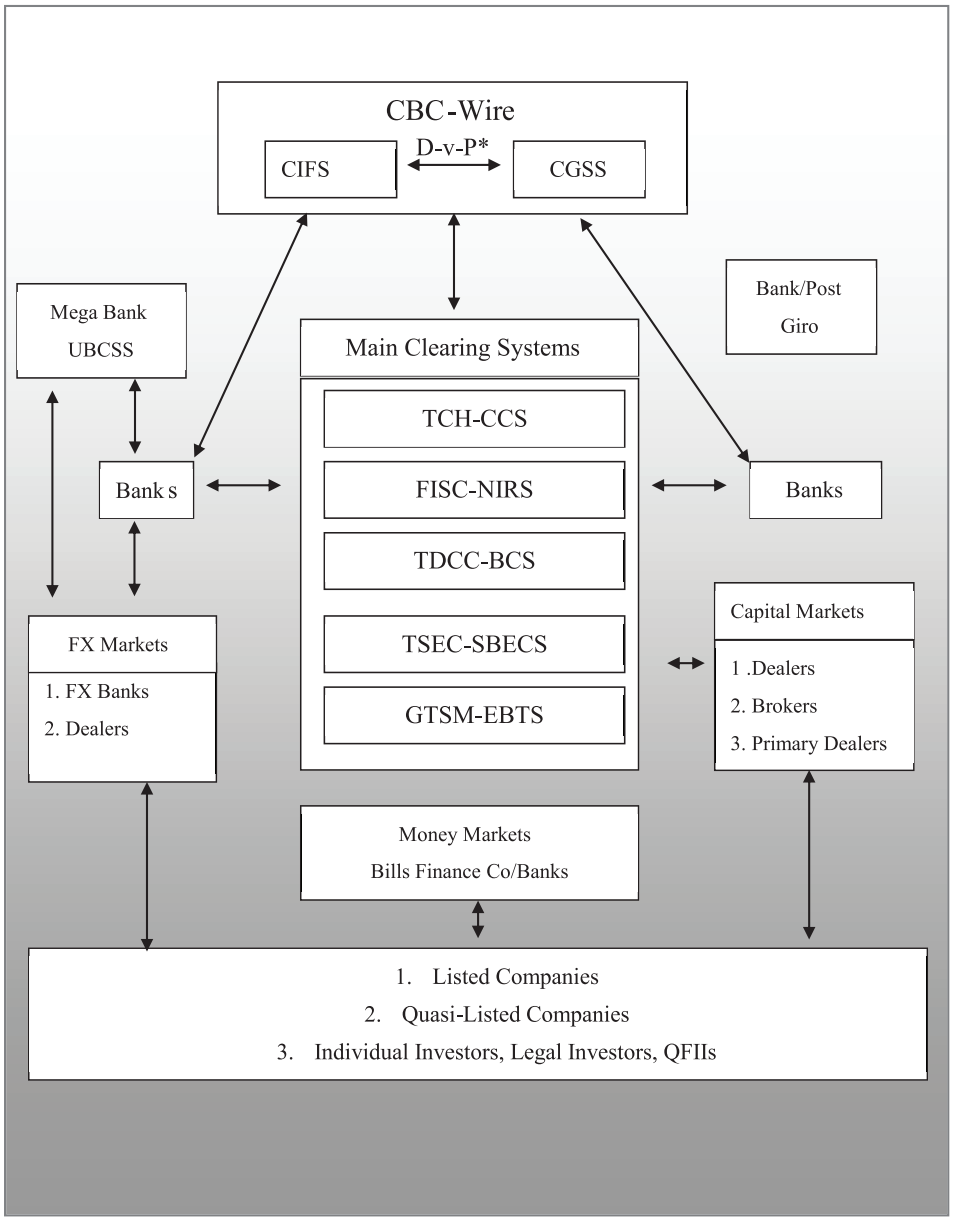
Appendix 1

Chart of Payment and Settlement Systems in Chinese Taipei



Appendix 2

Penetration Ratio of Non-Cash Instruments in Chinese Taipei

By Value (%)	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Paper-based										
Cheques	11.762	9.992	8.065	6.257	6.181	5.635	4.817	4.032	3.806	3.822
Card-based	2.863	2.896	2.950	2.742	2.624	2.718	2.924	2.074	1.985	2.010
1. ATM cards	2.541	2.542	2.568	2.370	2.265	2.361	2.595	1.760	1.673	1.671
2. Credit cards	0.321	0.354	0.380	0.371	0.357	0.353	0.326	0.311	0.308	0.332
3. Debit Cards	0.001	0.001	0.001	0.001	0.002	0.003	0.003	0.003	0.004	0.006
Electronic-based	0.356	0.593	0.836	0.836	0.938	1.136	1.244	0.993	1.156	1.420
1. FEDI	0.293	0.482	0.671	0.643	0.630	0.684	0.698	0.582	0.553	0.537
2. FXML	0.000	0.000	0.000	0.004	0.005	0.009	0.016	0.035	0.164	0.357
3. Internet Banking	0.002	0.003	0.003	0.004	0.003	0.109	0.094	0.084	0.094	0.106
4. Mobile banking	0.001	0.002	0.002	0.002	0.002	0.001	0.001	0.001	0.001	0.001
5. Bill Payment	0.000	0.000	0.001	0.003	0.007	0.008	0.006	0.009	0.012	0.022
6. On-Batch Media	0.059	0.079	0.094	0.076	0.134	0.001	0.001	0.001	0.015	0.032
7. ACH	0.001	0.027	0.064	0.105	0.157	0.325	0.427	0.282	0.317	0.365
Large-value EFT	85.020	86.519	88.149	90.165	90.256	90.511	91.015	92.901	93.052	92.748
1. CIFS	56.434	56.894	58.726	64.314	63.340	63.032	65.828	71.223	71.768	71.129
2. NIRS	28.586	29.625	29.423	25.850	26.916	27.480	25.188	21.678	21.284	21.619
Total	100	100	100	100	100	100	100	100	100	100