ANALYTICAL FRAMEWORK IN ASSESSING SYSTEMIC FINANCIAL MARKET INFRASTRUCTURE: INTERDEPENDENCE OF FINANCIAL MARKET INFRASTRUCTURE AND THE NEED FOR A BROADER RISK PERSPECTIVE

ANALYTICAL FRAMEWORK IN ASSESSING SYSTEMIC FINANCIAL MARKET INFRASTRUCTURE: INTERDEPENDENCE OF FINANCIAL MARKET INFRASTRUCTURE AND THE NEED FOR A BROADER RISK PERSPECTIVE

Edited By
Nephil Matangi Maskay

The South East Asian Central Banks (SEACEN)
Research and Training Centre
Kuala Lumpur, Malaysia

Foreword

Financial Market Infrastructures (FMIs) play a critical role in the financial system and the broader economy by facilitating the clearing, settlement and recording of monetary and other financial transactions and thereby maintaining and promoting financial stability and economic growth. However, the trends of financial sector development and interdependence of FMIs affect the assessment and management of payment and settlement risk for FMIs. It is thus important to know the status of FMIs in member economies as well as the trend and observations of their interdependence.

Accordingly, the objectives of the study are to: (i) highlight trend of interdependence between FMI by initiating development of a simplified framework (both analytical and operational); (ii) provide observations on the situation of payment transaction related information from economies of the nine SEACEN participating member central banks and monetary authorities; and (iii) propose recommendations in this regard.

This collaborative research was led by the Project Leader, Dr. Nephil Matangi Maskay, Director of Office of the Governor, Nepal Rastra Bank and concurrently Visiting Research Economist of The SEACEN Centre (OP 2013).

The SEACEN Centre wishes to express its sincere gratitude to the Project Leader and participating member central banks/monetary authorities and their respective researchers for actively participating in this project and preparing the chapters of their respective economies. They are: Mr. Edwin Prabu, Research Officer, Department of Economic and Policy Research of Reserve Bank of India; Mr. Irwanto, Assistant Director, Accounting and Payment System Department of Bank Indonesia; Mr. Jong Sang Lee, Economist, Payment Systems Policy Team, Payment & Settlement System Department of The Bank of Korea; Mr. Hari Gopal Adhikari, Deputy Director, Development Bank Supervision Department of Nepal Rastra Bank; Mr. Wilson Epe Jonathan, Manager, Economics Department of Bank of Papua New Guinea; Ms. Cristeta Bagsic, Bank Officer V, Center for Monetary and Financial Policy of Bangko Sentral ng Pilipinas; Mrs. K.M.A.N. Daulagala, Director, Financial Stability Studies Department of Central Bank of Sri Lanka; Ms. Jane C.C. Chen, Senior Specialist, Department of Banking and Ms. Yilin Tsai, Officer, Department of Banking both of Central Bank, Chinese Taipei and Mr. Ngo Vi Trong, Lecturer, Faculty of Finance, Banking University HCMC, State Bank of Vietnam

TABLE OF CONTENTS

Chapter 1
ANALYTICAL FRAMEWORK IN ASSESSING SYSTEMIC FINANCIAL MARKET INFRASTRUCTURE: INTERDEPENDENCE OF FINANCIAL MARKET INFRASTRUCTURE AND THE NEED FOR A BROADER RISK PERSPECTIVE
By Nephil Matangi Maskay

Chapter 2
ANALYTICAL FRAMEWORK IN ASSESSING SYSTEMIC
FINANCIAL MARKET INFRASTRUCTURE OF INDIA
By Edwin Prabu A.

Chapter 3
ANALYTICAL FRAMEWORK IN ASSESSING SYSTEMIC
FINANCIAL MARKET INFRASTRUCTURES IN INDONESIA
By Irwanto

Chapter 4
FINANCIAL MARKET INFRASTRUCTURE INTERDEPENDENCIES IN KOREA
By Jongsang Lee and Seungjin Baek

Chapter 5
AN ANALYTICAL FRAMEWORK IN ASSESSING SYSTEMIC
FINANCIAL MARKET INFRASTRUCTURE: NEPAL – FOCUS
ON PAYMENT AND SETTLEMENT SYSTEM
By Hari Gopal Adhikari

Chapter 6
ANALYTICAL FRAMEWORK IN ASSESSING SYSTEMIC
FINANCIAL MARKET INFRASTRUCTURE OF
PAPUA NEW GUINEA
By Wilson E. Jonathan

Chapter 7
THE PHILIPPINE PAYMENT SYSTEM
By Cristeta Bagsic

Chapter 8
ANALYTICAL FRAMEWORK IN ASSESSING SYSTEMIC
FINANCIAL MARKET INFRASTRUCTURE – SRI LANKA
By K. M. A. N. Daulagala

Chapter 9
ANALYTICAL FRAMEWORK IN ASSESSING SYSTEMIC FINANCIAL MARKET INFRASTRUCTURE IN CHINESE TAIPEI
By Chuan-Chuan Chen and Yilin Tsai

Chapter 10
**ANALYTICAL FRAMEWORK FOR ASSESSING THE
SYSTEMIC FINANCIAL MARKET INFRASTRUCTURE
IN VIETNAM**
By Trong Vi Ngo and Anh Hoang Ly

Executive Summary

Financial Market Infrastructures (FMIs) play a critical role in the financial system and the broader economy by facilitating the clearing, settlement and recording of monetary and other financial transactions and thereby maintaining and promoting financial stability and economic growth. However, the trends of financial sector development and interdependence of FMIs affect the assessment and management of payment and settlement risk for FMIs. In this regard and as part of a more comprehensive endeavor, the Committee of Payment and Settlement Systems of the Bank of International Settlements has published a unified set of standards and practices in April 2012 for the design, operations and strengthening of FMIs, and also highlighted the potential risk from interdependence. While these are laudable developments, there is a need to examine how this conceptual discussion in general and interdependence in particular, has carried over into risk management.

An objective of the research is to highlight the growing interdependence through development and observations from a simple framework, which maps out the process of payment and settlement involving FMIs. This is applied to the economies of the nine participating SEACEN member central banks and monetary authorities of the Reserve Bank of India; Bank Indonesia; The Bank of Korea; Nepal Rastra Bank; Bank of Papua New Guinea; Bangko Sentral ng Pilipinas; Central Bank of Sri Lanka; Central Bank, Chinese Taipei; and State Bank of Vietnam.

Examing the stylized indicators of participating SEACEN member economies reflects the extreme heterogeneity of participants' economies and FMI situation as well as data quality. Based on discussion with Project Team Members (PTMs), an operational framework is developed focusing on information from respective payment system. Time series data is collected of the period 2003 – 2012. Interdependence is suggested by triangulating three perspectives: first, trend of transaction data, which are categorized by market of origin – i.e. money market, bond market, FOREX market, and securities market – where it is also assumed that each market has its own specific process – i.e. an eco-system of FMIs; second, participants in payment system are classified by participation in single or multiple markets; lastly observations from Project Team Member's report.

It is observed that the volume of payment transactions have steadily increased over the period, with the Global Financial Crisis not significantly disrupting the FMIs in general and the payment system (PS) in particular. The analysis shows

that there is growing interdependence in the respective economies. It is suggested that a role is being played by financial innovation with there being a majority of significant coefficient of correlations. However, there is no clear direction of contribution – they are divided between being significantly positive or significantly negative. This makes simple categorization difficult and despite the above, implies a need for implementing a more comprehensive risk perspective.

The integrated paper ends by making four recommendations to:

(1) Enhance and strengthen collaboration and coordination of cooperative arrangements for FMI regulators in charge of oversight and supervision, such as for having "joint emergency response drills". As an initial step, an economy coordinating framework for oversight authorities as well as a regional information-sharing scheme can both be established; the latter can analyse and assess cross-border risks posed by systemic FMIs.

(2) Enhance monitoring on FMIs and upgrade data collection methodology and their scope, such as to capture direct and indirect interdependence – this is especially true for developing economies; this may also result in production of a master plan for FMI development which is economy specific.

(3) Incorporate a wider and broader perspective when assessing payment and settlement risk to FMIs, such as through interdependence (which enhances contagion effect). It is felt that taking this aspect into consideration will help adequately provide for financial (capital) buffers and also their Business Contingency Plan – this is especially true for developing economies.

(4) Develop more rigorously an analytical framework, which examines and assesses the relationship and interdependence of PS (which is generalised to reflect FMI interdependence) within and between member economies in relation to growing FD.

Chapter 1

**ANALYTICAL FRAMEWORK IN ASSESSING SYSTEMIC
FINANCIAL MARKET INFRASTRUCTURE:
INTERDEPENDENCE OF FINANCIAL MARKET
INFRASTRUCTURE AND THE NEED FOR A BROADER
RISK PERSPECTIVE**

By
Nephil Matangi Maskay[*]

1. Background

Financial Market Infrastructures (FMIs) play a critical role in the financial system and the broader economy as they facilitate the clearing, settlement and recording of monetary and other financial transactions. Thus, FMIs are important for the effective implementation of monetary and fiscal policy. Equally important is their effect on the efficient functioning of financial markets in order to maintain and promote financial stability and economic growth.

It is generally felt that although FMIs performed well during the 2008 global financial crises, the events had highlighted some important lessons for effective risk management (this has also been pointed out by a number of authors, such as Hildebrand [2009]). A broader systemic stability focus is one of the key lessons that has emerged. There is consensus that FMIs is one of the first places where financial stress can manifest itself. These vulnerabilities faced by FMIs may expose the financial system to payment and settlement risks, which is described by the Bank for International Settlements in BIS (2008, 27) as including "credit risks, liquidity risks, operational risks, legal risks and market risks". These shocks through liquidity dislocations or credit losses can be transmitted across domestic and international financial markets, i.e., through contagion and domino effects. In this regard and acknowledging the importance

_____

* Director, Nepal Rastra Bank & Visiting Research Economist, The SEACEN Centre, Malaysia. Tel: + 977 9803059409 (Mobile). E-mail: nmmaskay@nrb.org.np and nephil_m_maskay@hotmail.com.

of FMIs to the smooth functioning of the financial system, the international community on April 2012, through the Committee on Payment and Settlement Systems (CPSS) of the Bank for International Settlements (BIS) published a set of unified standards and practices for the design, operations and strengthening of FMIs - this is composed of 24 Principles and 4 Responsibilities (henceforth called as PFMI) and is provided below.

Box 1
Principles for Financial Market Infrastructures

General Organisation
Principle 1: Legal basis
Principle 2: Governance
Principle 3: Framework for the comprehensive management of risks

Credit and Liquidity Risk Management
Principle 4: Credit risk
Principle 5: Collateral
Principle 6: Margin
Principle 7: Liquidity risk

Settlement
Principle 8: Settlement finality
Principle 9: Money settlements
Principle 10: Physical deliveries

Central Securities Depositories and Exchange-of-value Settlement Systems
Principle 11: Central securities depositories
Principle 12: Exchange-of-value settlement systems

Default Management
Principle 13: Participant-default rules and procedures
Principle 14: Segregation and portability

General Business and Operational Risk Management
Principle 15: General business risk
Principle 16: Custody and investment risks
Principle 17: Operational risk

Access
Principle 18: Access and participation requirements
Principle 19: Tiered participation arrangements
Principle 20: FMI links

Efficiency
Principle 21: Efficiency and effectiveness
Principle 22: Communication procedures and standards

Transparency
Principle 23: Disclosure of rules, key procedures, and market data
Principle 24: Disclosure of market data by trade repositories

Responsibilities of Central Banks, Market Regulators, and Other Relevant Authorities for Financial Market Infrastructures
Responsibility A: Regulation, supervision, and oversight of FMIs
Responsibility B: Regulatory, supervisory, and oversight powers and resources
Responsibility C: Disclosure of policies with respect to FMIs
Responsibility D: Application of the principles for FMIs
Responsibility E: Cooperation with other authorities

Source: BIS (2012).

While these are laudable developments, there is a need to examine how this conceptual discussion in general and interdependence in particular, has carried over into risk management.

1.1 Objectives

Based on the above statement, the objectives of this research are as follows:

1. Highlight the trend of interdependence between FMI by initiating the development of a simplified framework (both analytical and operational);

2. Provide observations on the situation of payment transaction related information from nine participating SEACEN member economies; and

3. Propose recommendations in this regard.

1.2 Limitations

The study faces two major limitations. The first is attributed to the current and developing nature of the topic. The second is the diverse nature of financial development in the SEACEN member economies, which makes it complex to balance the choice of a common methodology. This also impacts on the quality and quantity of the analysis.

1.3 Participants

There are nine members of SEACEN, that participated in this research project with involvement of ten project team members (PTM). The participating SEACEN members are: Reserve Bank of India; Bank Indonesia; The Bank of Korea; Nepal Rastra Bank; Bank of Papua New Guinea; Bangko Sentral ng Pilipinas; Central Bank of Sri Lanka; Central Bank, Chinese Taipei; and State Bank of Vietnam. A brief snapshot of member economies stylised statistics is provided below in Table 1:

Table 1
Stylised Statistics on Participating SEACEN Member Economies

	GDP	Pop	Area	GT	KA	EI	FD	PST	PS
India	1,842	1,210	3,287	C	B	44%	52%	1,330%	1,020%
Indonesia	878	247	1,905	A	B	50%	69%	1,168%	1,156%
Korea	1,129	50	100.1	C	C	110%	110%	5,800%	4,430%
Nepal	18.96	26.5	147	B	B	88.90%	NP	NP	NP
Papua New Guinea	15.53	7.0	462	A	B	98%	26%	132%	132%
Philippines	142.82	95.8	300	A	C	96%	38%	3,309%	3,309%
Sri Lanka	59.42	20	65.6	A	B	49%	42%	570%	570%
Chinese Taipei	474	23	36	A	C	140%	176%	3,726%	2,761%
Vietnam	355*	88.8	331	C	B	157%	104%	548%	548%

Note: 1. "GDP (in billion US $ dollars)" is Gross Domestic Product in 2012; 2. "Population (in millions)" in 2012; 3. "Area (thousand square kilometers)"; 4. "GT" is Geographical type A. Island, B. Landlocked C. Neither A or B; 5. "KA" is Capital Account A. Not liberalised B. Partially liberalised C. Fully liberalised; 6. External Integration ("EI") indicator is (X of goods and services + M of goods and services)/GDP; in 2012; 7. Financial Development ("FD") indicator is the ratio of total credit of commercial banks and other deposit-taking banks to the private sector by nominal GDP in 2012; 8. Payment System Total ("PST") is total payment system transactions in the economy by GDP in 2012; 9. The identified transaction of the Payment System by GDP in 2012 ("PS"); this is a component of PST above, where if there is only one payment system then figure for PST and PS will be the same; "*"GDP at PPP, current international dollars. Source: Based on the SEACEN PTM Reports. For Philippines based on draft report and from Workshop presentation.

2. Framework for Analysis

As mentioned, FMIs support the development of the financial system by allowing the clearing, settlement and recording of monetary and other financial transactions. The description of the five major types of FMIs is presented below:

(a) Payment systems (PS): A payment system is a set of instruments, procedures, and rules or for the transfer of funds between or among participants; the system includes the participants and the entity operating the arrangement.

(b) Central Securities Depositories (CSD): A central securities depository provides securities accounts, central safekeeping services, and asset services, which may include the administration of corporate actions and redemptions. A CSD can hold securities either in physical form (but immobilised) or in dematerialised form (that is, they exist only as electronic records).

(c) Securities Settlement Systems (SSS): A securities settlement system enables securities to be transferred and settled by book entry according to a set of predetermined multilateral rules.

(d) Central Counterparties (CCP): A central counterparty interposes itself between counterparties to contracts traded in one or more financial markets, becoming the buyer to every seller and the seller to every buyer and thereby ensuring the performance of open contracts.

(e) Trade Repositories (TR): A trade repository is an entity that maintains a centralised electronic record/database of transaction data.

2.1 Analytical Framework

The five types of FMIs interact together and contribute completing the process of financial trade. This process is represented schematically below.

Diagram 1
Interdependence of FMIs

Source: Author manipulation based on BIS (2008, p. 18) by inclusion of TR and SSS as part of securities settlements
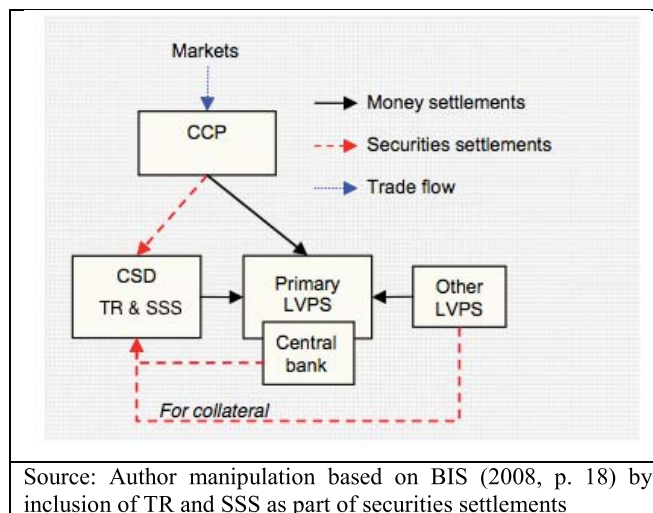
The Table clearly shows that every financial trade enters the financial system where it is settled and recorded. However, a financial trade is finally settled with payments, which complete the transaction process. Naturally, the process of financial trade entails payment and settlement risk, which is assessed and provisioned by the respective FMIs.

2.2 Interdependences

The PFMI is cognizant of growing interdependence of FMIs and has highlighted this situation in Principle # 20. Further, BIS 2008 had attributed growing interdependence to the "integration of the financial sector, consolidation of financial institutions, and advances in computer and telecommunications technology" (BIS, 2008, 14). Through these relationships, it is felt that the smooth functioning of a single system often becomes contingent on the performance of one or more of other systems. In addition, the individual systems are often reliant on common third parties, financial markets or other factors. Consequently, the operational processes of the settlement flows and even risk management procedures of the individual systems are often not independent (but materially interdependent) with those of other systems.

The conceptual relationships resulting from interdependencies are discussed by BIS (2008) where they group independence into three broad categories:[1]

(i)   *System-based Interdependencies*, where the FMIs are directly linked. Conceptually, this can be both of vertical (e.g. interdependence between different systems, such as CCP with PS) as well as horizontal (e.g. interdependence between the same system, such as between two PS) in nature.

(ii)   *Institution-based Interdependencies*, where FMIs are indirectly linked, by a financial institution.

(iii) *Environmental Interdependence*, which captures broader factors which commonly affect FMIs, such as network providers and multiple systems common elements of the physical infrastructure (such as power, water, etc.). This concept of interconnectedness is shown schematically below:

––––––––––––––––

1.   Interdependence has another conceptual dimension: it can be described as being limited to the domestic economy or from being cross-border. For (i), this example may be a link of different payment systems (e.g. RTGS), such as TARGET 2 in Europe; for (ii) this may also be through correspondent banks such as for international trade; for (iii) this may be reflected, for example, in a common cross-border payment system, such as the SWIFT service. However, the focus at this stage will only be on domestic currency transactions.

Diagram 2
Categories of Interdependence

| Source: Source: BIS, 2008 p. 10. |
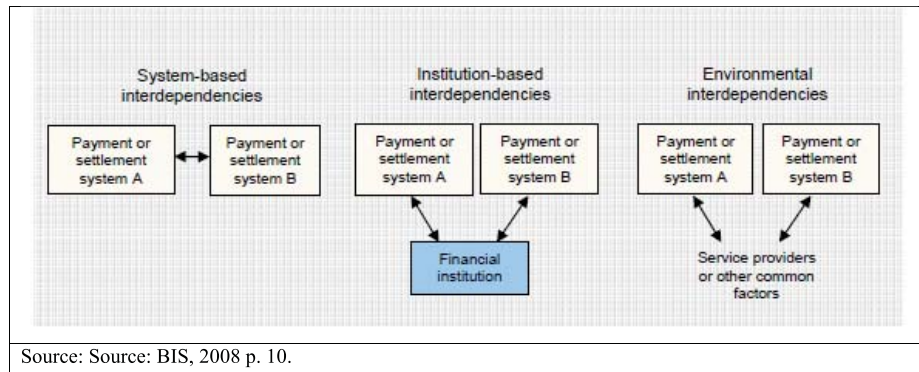
The paper follows an iterative process moving from conceptual framework to operational framework; this is mainly based on discussion with the PTMs. At the outset, the PTMs had pointed out the difficulty in obtaining information in their respective economies relating to interdependence, even from questionnaire surveys and expert interviews. Looking at the analytical framework provided in Diagram 1, which suggests that while all the FMIs interact together in the financial system regardless of market origin, they terminate with finality of payments. It was thus felt that PS transaction data (PTD) provides some information on interdependence. The ease of obtaining payment related transaction data by the PTMs (since the main supplier of transaction data is under the responsibility of the respective member institutions) was also highlighted. Given this discussion, the research focuses on the PS and is limited to the PTD. However, it is noted that this narrow focus limits the analysis, since the PTD is not very "granular" and aggregates all transactions of the financial system together into a single unit of information. The challenge is thus two-fold: how to "squeeze" more information from the PTD and how to use this to gather information on the issue of FMIs' interdependence. Looking at the framework in more detail suggests that each PTD reflect trade and settlement flows encompassing all FMIs (i.e. which can be described as reflecting an eco-system of the FMI). In this regard, one level of granularity is for the data to be categorised by their market of origination. In this regard, transactions are categorised as originating in four segments of the financial markets as follows:

- Money Market
- Bond Market

- FOREX Market.

- Securities Market [2]

This representation is provided diagrammatically below:

Diagram 3
Disaggregating of PS Transaction by Markets

Source: Author.
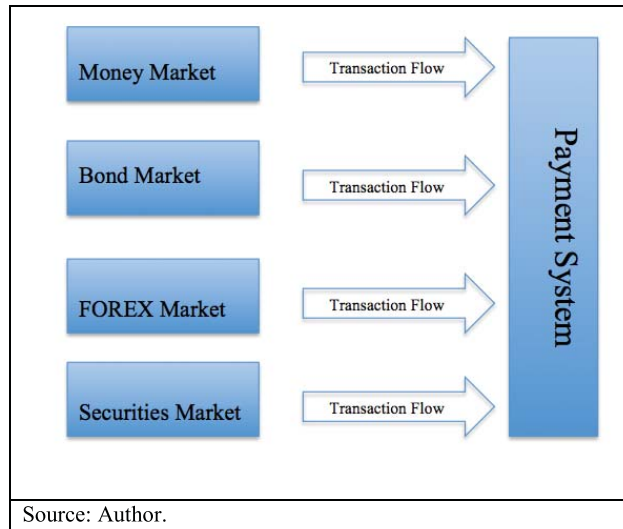
It is further assumed that each of the above four markets is taken to represent all the five types of FMIs in the process of financial trade and thus an "eco-system" of the FMIs.[3] The above framework in Diagram 3 is taken as the operational framework of the paper where the focus is on payment transaction, which is categorised by markets:

2.3 Method of Assessment of Interdependence

Given the absence of a direct method for assessing interdependence, the study triangulates information from three different perspectives focusing on the PTD.

_____

2. This market potentially can include the bond market but for this analysis, the bond market is taken as separate.

3. As one example, the money market reflects grouping of specialised CCP, CSD, TR and SSD; the same is taken for bond, forex and securities markets.

(i) PTD: the study focuses on domestic currency transactions.[4] The span of examination is of annual frequency (monthly, if available) covering the ten-year period 2003 – 2012. In addition, the PTM will categorise the PTD by market origination (i.e. money, bond, FOREX, securities).

(ii) Participants in PS: Based on the categorisation of four markets above, the PTM will determine if the individual PS participants' are involved in single or multiple markets;

(iii) PTM observations: This is based on PTM submitted reports.

This operational framework is implemented in the next section.

3. Data Collection

The first sub-section integrates observations from the FMI stylised facts of each PTM economy; the second sub-section integrates the provided PTDs.

3.1 Stylised Facts of FMIs Situation

The PTM reports provide the status of legal and regulatory environment as well as maps out the FMIs (similar to Diagram 2) for each economy; this is provided in attached PTM reports and suggests there exists large variation. For one example comparing the Indian and Korean economy, while both have comprehensive acts and regulation, in the prior economy there is more decentralised presence of FMIs representing all five types of FMIs in each of the four markets. However, in the latter economy while there is representation of the FMIs, however, this is more centralised/consolidated with only one being represented in all four markets. Also another extreme is that of the Nepalese economy, which presently has absence of comprehensive acts and regulation and poorly developed FMIs as well as difficulty in obtaining the PTD.

In addition to the acts and regulation, there is the necessity for oversight and supervision of the FMIs, including that of the PS. The importance of this is seen in a number of publications, namely IMF (2012, a. & b.), BOE (2012) and the Monetary Authority of Singapore (MAS, 2013) as well as Morganand and Lamberte (2012). The authority responsible for oversight, supervision and onsite inspection (done by the supervisory authority) of the respective FMIs in the PTM economies, is provided below:

_____

4. This is based on the information provided by the PTM reports where the identified PS either covers all transactions or a significant amount of transaction in the economy.

Table 2
Responsibilities of Oversight, Supervision and On-site Inspection

	Members Economies	PS	Non-PS	Remarks
1	India	RBI	Securities and Exchange Board of India	RBI also has responsibility of CCP and TR
2	Indonesia	BI	Otoritas Jasa Keuangan	BI also has responsibility of SSS
3	Korea	BOK	Financial Services Commission (FSC) and BOK	FSC has generally the responsibility of supervision and on-site inspection even for PS.
4	Nepal	NP	NP	
5	Papua New Guinea	BPNG	BPNG	Except for Port M. Stock Exchange
6	Philippines	BSP	NP	
7	Sri Lanka	CBSL	CBSL for public and Securities exchange Commission for private	
8	Chinese Taipei	CBCT	FSC	FSC has oversight responsibility of one PS and also generally supervision and onsite inspection; SS under full responsibility of CBCT
9	Vietnam	SBV	SBV, Ministry of Finance and State Securities Commission	
Source: Based on the SEACEN PTM Reports. NP = Not provided in PTM Report.				

The respective SEACEN members in all cases have oversight authority of the PS in their economies. However, for the other FMIs, the responsibility varies by economies, with there existing other oversight and supervisory authorities.

The focus of the research is on PTD. In this regard, the name of the main PS in the respective economies from which the PTD is obtained along with indication of the mechanism for handling Large-value Payment System (i.e., does this represent a Real Time Gross Settlement [RTGS]) and the span of data are provided in the Table 3 below:

Table 3
Information on PS Transaction Data

SN	Economies	PS	RTGS	Span of Transaction Data
1	India	RBI RTGS	Y	2006/07 – 2012/13
2	Indonesia	BI-RTGS	Y	2002 - 2012
3	Korea	BOK-Wire+,	Y	2003-2012
4	Nepal	At NRB	N	
5	Papua New Guinea	At BPNG	N	2003- 2013;
6	Philippines	PhilPass,	Y	2003 – 2013
7	Sri Lanka	LankaSettle	Y	2003 – 2012
8	Chinese Taipei	CBC Interbank Transfer System	Y	2003 – 2012
9	Vietnam	At SBV	N	2002 – 2012
Source: PTM Reports.				

The above table suggests that the use of RTGS for handling Large Value transactions is not uniform. However, Table 1 provides that the identified PS captures the majority of PS transaction or in three cases is the only PS in the economy.

3.2 Statistics from PS

The PTMs have obtained the PTD from the above-identified PS both in aggregate form and disaggregate form (i.e. categorised by market of origination). The data is provided in Annex 1. In general, the data suggests that the origination of transaction by markets, in any given point of time and by economies varies, which is all the more true when examining the full period. This suggests that the PTD reflect changing economy specific situations. However, the consistent and increasing trend of the FOREX market suggests that external transactions are gaining in importance. Given this variation, examining the trend of aggregate PTD is easier for comparison, and is thus provided in the diagram below:

Diagram 4
Annual Market Value of Transactions (in US$ billion)
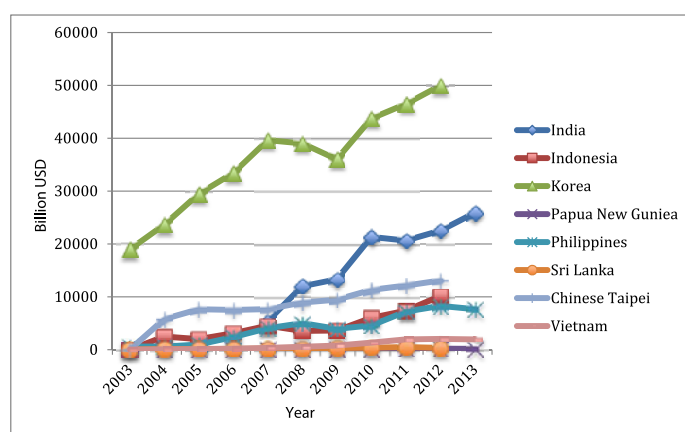
Source: Based on the SEACEN PTM Reports and graphically presented from Table 3.

Based on the prior identified PS, the number of participants is provided as well their participation in multiple markets over the ten year span of 2003 – 2012 and is represented above.

11

Table 4
Total PS Participants and (if Provided)
No. of Participant in Multiple Markets

SN		3	4	5	6	7	8	9	10	11	12
1	India PS: Total No. of Participants					105	106	119	120	128	
2	Indonesia PS: Total No. of Participants						196	191	191	188	189
3	Korea PS: Total No. of Participants	128	123	123	122	122	129	129	128	133	132
	2 Mkts.	51	51	51	51	51	52	52	52	52	53
	3Mkts.	23	23	23	23	23	23	23	23	23	23
	4Mkts.	18	18	18	18	18	18	18	18	18	18
4	Nepal PS: Total No. of Participants	NP									
5	Papua New Guinea PS: Total No. of Participants in September 2013	48									
	2 Mkts.	41									
	3Mkts.	3									
	4Mkts.	4									
6	Philippines PS: Total No. of Participants	NP									
7	Sri Lanka PS: Total No. of Participants (year not provided)	117									
	2 Mkts.	9									
	3Mkts.	1									
	4Mkts.	24									
8	Chines, Taipei PS: Total No. of Participants	101	98	96	89	87	83	84	79	78	81
9	Vietnam PS: Total No. of Participants	34 participants (in 2013)									
	Source: Based on the SEACEN PTM Reports. NP = Not available in PTM Report.										

The involvement of participants in multiple markets suggests presence of indirect (i.e. institutional) interdependence in the majority of PTM economies. This is also consistent with the majority of the PTM reports. The PTM report from India is highlighted, which states: "In India, this *(institutional-based interdependencies)* is highly evident as all major financial institutions are participants in all systems." (SEACEN 2013a, p. 11, from RBI 2008; italics mine). The PTM report from India gives evidence of this by providing network analysis of the Indian Payment System, which demonstrates the interconnectedness among the financial institutions and markets, and is provided below:

Diagram 5
Network of Banks in the RTGS System

Source: From SEACEN (2013a) as quoted from the Financial Stability Review, RBI, December 2011.
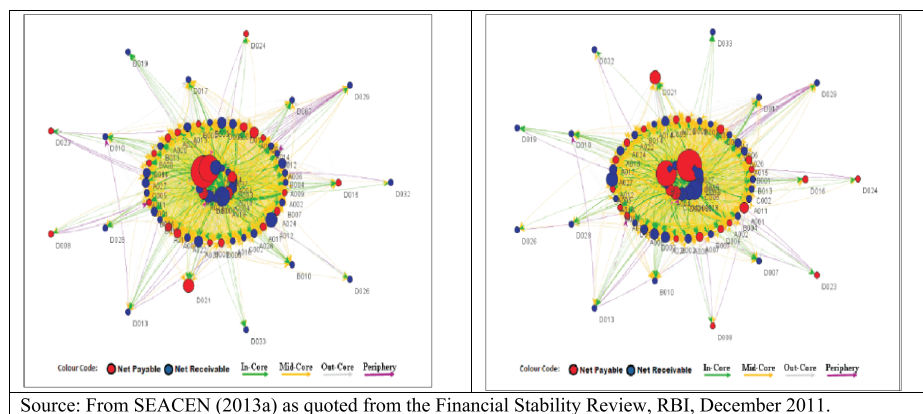
4. Observations and Discussion

Five observations from the PTM reports are summarised.

1. **There is diversity in the level of SEACEN-participating PTM economies and their respective FMI situation.** The statistics provided in Table 1 reflect this where the PTM economies have diverse economic sizes[5] and population numbers[6], diverse geographical characteristics, however having some similarity in regard to convergence in openness of their capital accounts –i.e. being either partially liberalised or fully liberalised. The PTM economies also have diverse levels of external integration[7], financial development[8] and payment system transactions[9].

Table 5 shows the authorities in charge of oversight of FMI. These can be grouped as either of PS or non-PS. There is consistency in two regard: first that the respective SEACEN members having authority over PS and second, there

----

5. The ratio of the largest PTM economy, Indian, to the smallest PTM economy, Papua New Guinea, is 118.61 times.

6. The ratio of the most populous economy, India, to that of the least populous economy, Papua New Guinea, is 172.8 times.

7. The ratio of the economy with the highest EI, Korea, with that of the least economy with the lowest EI, India, is 2.5 times.

8. The ratio of the extreme FD statistic, this highest FD, the Korea economy with that of the least FD, the Philippines economy, is 6.8 times.

9. The ratio of, the highest PST, Korea, with that of the least PST, Sri Lankan, is 10.2 times.

13

is fragmentation of responsibilities for non-PS. Also and from the PTM reports, there seems to be relatively less collaboration of oversight and supervisory authorities. This situation also carries over into the international context where there is increasing trend of FOREX transactions. However there is apparently limited coordination of payment system oversight, supervision and inspection authorities.

2. **There is a generally continuously increasing trend of payment transactions.** This can be seen figuratively in Diagram 4 where the average ratios (i.e., transaction in 2012/transaction in 2003) of eight economies (India, Indonesia, Korea, Papua New Guinea, Philippines, Sri Lanka, Chinese Taipei and Vietnam) for the period 2003 – 2012, is 10.83 times.

However, this aggregate statistic hides two separate averages – the first is of 13.85, which is the average value for Indonesia, Papua New Guinea, Philippines Sri Lanka and Vietnam and the second of 2.7, which is the average value for Korea and Chinese Taipei. This may be because the latter group is in a mature market environment having FD indicators of 110% and 176%, respectively, while the prior group is in a developing market environment having FD indicator of 69%, 26%, 38%, 42% and 104%, respectively, (this is also true for India for the shorter period of 2006/07 – 2012/13, with a ratio of 4.7 and FD statistic of 52%)[10]. The higher growth of the latter group may reflect both the trend of payment transactions as well as expansion of the payment transaction net. Similar to international experience mentioned earlier, there has not been a significant impact on the PS as well as pressure on the PS transactions (except for Korea) during GFC. There has also not been a significant impact on the respective economy payment transactions (SEACEN PTM Reports, 2013). This may be because most countries are not significantly linked with the Global Payment System; notable examples to the contrary are: BI-RTGS-USD Chats (Indonesia); CLS Bank (Korea), CCIL as a third-party member of a CLS Settlement Bank (India).

---

10. It is noteworthy to point out that Vietnam has ratio of 47.2 but FD indicator of 104%, the significant growth despite the high FD indicator is attributed to catching up of PS transactions, having started from a small base.

3.   **The analysis suggests that interdependence in the domestic economy is increasing. However, there is less acknowledgement in assessing the transmission of risk.** The statistics provided in **3.1** suggest, by triangulation of the three perspectives that interdependence in the participating SEACEN economies has increased. While there are many discussions on the importance of interconnectedness (such as by BIS, 2008), this has been less put into practice for assessing the transmission of risk as well as its management. An indication of this is the difficulty faced by many PTMs in obtaining data with the appropriate level of detail for analysis. Importantly, the unavailability of data and thus, the fewer acknowledgements (such as lack of Business Continuity Plan) imply that this aspect is relegated to less important for overall risk assessment and management. Also, the fragmented responsibility oversight divided into PS as well as non-PS shown in Table 2, suggests that there is less acknowledgement of the process of financial trade and that there is lack of a broader and more comprehensive risk perspective.

4.   **PS transactions to GDP generally are correlated with FD indicators but less so with Stock Market Development indicators:** The observation that financial innovation and consolidation contributes to interdependence of FMIs is consistent with BIS (2008). The research assesses the relationship in the participating SEACEN economies, by looking at the correlation of PS transactions by GDP with three alternative measures of FD Indicators – (1) *Liqliab* - the sum total of currency plus demand and interest-bearing liabilities of commercial bank and non-banks divided by nominal GDP; (2) *Commbank* - the total asset of commercial banks divided by sum of commercial bank and central bank assets. (3) *Bankcred* - the ratio of total credit of commercial banks and other deposit-taking banks to the private sector by nominal GDP. The correlation matrix of these alternative measures with PS/GDP is provided below:

15

Table 5
Correlations between PS/GDP and FD/GDP Indicators

	Liqlia	Commbank	Bankcred
India	0.87***	0.99***	0.99***
Indonesia	0.258	-0.136	0.151
Korea	0.83743***	-0.76818***	0.78636***
Nepal	NP	NP	NP
Papua New Guinea	0.216	0.117	-3.204
Philippines	0.74***	-0.78***	-0.49***
Sri Lanka	0.01	-0.43***	-0.33**
Chinese Taipei	0.77***	0.38***	0.74***
Vietnam	0.2165	0.3238**	0.4784**

Note: "*", "**", "***" = Significant at "10%", "5 %". "1%" Level of confidence, respectively; "NP" = Not Provided; The coefficient of correlation is provided in the parenthesis; Data Span for India 2006/07-2012/13; Indonesia 2002 − 2013; Korea 2003:1 − 2012:4; Papua New Guinea 2003-2013; Philippines 2003:1 − 2012:4; Chinese Taipei 2003:1 − 2012:12; Sri Lanka 2002 − 2012; Vietnam 2002-2012 Also for the case of Korea quarterly data was used; it was also found through ADF test that variables had a unit root; after taking log differences the results are now found to be insignificant.
Source: Based on the SEACEN PTM Reports.

Similarly, the research uses three alternative measures of Stock Market Development Indicators (SMD), namely – (1) *MktCap* - total value of stocks in the domestic market divided by GDP; (2) *ValTrade* - total value of stock being traded by GDP; (3) *Turnover* - total value of stocks being traded divided by the total value of stocks listed in the domestic market. The correlation matrix of these alternative measures with PS/GDP is provided below:

Table 6
Correlations between PS/GDP and SMD/GDP Indicators

	MktCap	ValTrade	Turnover
India	NP	NP	NP
Indonesia	0.191	0.523	0.383
Korea	0.70088***	0.42054	-0.30096
Nepal	NP	NP	NP
Papua New Guinea	0.001	0.108	-0.00003
Philippines	0.31*	0.79***	0.75***
Sri Lanka	0.53***	0.62***	0.30*
Chinese Taipei	0.50***	0.03	-0.26***
Vietnam	0.5921**	0.6376**	0.3239

Note: "*", "**", "***" = Significant at "10%", "5 %". "1%" Level of confidence, respectively; "NP" = Not Provided; The coefficient of correlation is provided in the parenthesis; Data Span for India 2006/07-2012/13; Indonesia 2002 − 2013; Korea 2003:1 − 2012:4; Papua New Guinea 2003-2013; Philippines 2003:1 − 2012:4; Chinese Taipei 2003:1 − 2012:12; Sri Lanka 2002 − 2012; Vietnam 2002-2012 Also for the case of Korea quarterly data was used; it was also found through ADF test that variables had a unit root; after taking log differences the results are now found to be insignificant.
Source: Based on the SEACEN PTM Reports.

In both cases there is majority significant correlation. However, looking at the correlations in the prior Table 5, the direction of significant correlations are not consistent, it is both positive and negative and thus suggests a deeper need to understand the contribution of FD/GDP and SMD/GDP with PS/GDP.

5. Some Remarks and Recommendations

Based on the four observations from the previous section, some remarks and tentative recommendations are provided:

SN	Remarks	Tentative Recommendation
1.	• There is diversity in member economies • There is fragmentation of oversight and supervisory authorities between payment and settlement system and also within the latter.	• Suggests that no one size fits all solution. This analysis and recommendation can be generalised, however to be economy specific or at least made multiple tracks. • Enhance and strengthen collaboration and coordination of cooperative arrangements for FMI regulators in charge of oversight and supervision (keeping in view the PFMI), such as for having "joint emergency response drills"; o As an initial step, an economy wide coordinating framework for oversight authorities as well as a regional information-sharing scheme can be established
2	• There is increasing trend of payment system transactions.	• Suggests a need for production of a master plan for FMI development to more fully harness situation • Enhance monitoring on FMIs and upgrade data collection methodology and their scope, such as to capture direct and indirect interdependence – this is especially true for developing economies.
3	• There is growing interdependence of FMIs in the domestic economy and suggestive trend with external economy.	• Incorporate a wider and broader perspective when assessing payment and settlement risk to FMIs, such as interdependence (which enhances contagion effect). It is felt that taking this aspect into consideration will help adequately provide for financial (capital) buffers and also their BCP – this is especially true for developing economies.
4	• Interdependence seems to be driven by financial development and innovation.	• Develop more rigorously an analytical framework, which examines and assess the relationship and interdependence of PS (which is generalised to reflect FMI interdependence) within and between member economies in relation to growing FD.

By ending, and due to the prior mentioned limitations, which is taken as caveats, these should be used as preliminary results only to be refined with the passage of time. These caveats point to areas of further research in this important area of understanding interdependence and effect on risk management.

References

Bank for International Settlements, (2012), "Principles for Financial Market Infrastructure: Disclosure Framework and Assessment Methodology," Available at: http://www.bis.org/publ/cpss106.pdf

____ (2012), "Principles of Financial Market Infrastructure," Available at: http://www.bis.org/publ/cpss101a.pdf

____ (2008), "The Interdependencies of Payment and Settlement Systems," http://www.bis.org/publ/cpss84.pdf

____ (2003), "A Glossary of Terms Used in Payments and Settlement Systems," http://www.bis.org/publ/cpss00b.pdf

Bank of England, (2012), "The Bank of England's Approach to the Supervision of Financial Market Infrastructures," Available at: http://www.bankofengland.co.uk/publications/Documents/news/2012/nr161.pdf

Hildebrand, Philipp M., (2009), "Lessons from the Crisis for Global Financial Market Infrastructure," Delivered at 14th Zermatt Symposium entitled *The Financial Market Crisis – Two Years on. Available at:* http://www.snb.ch/en/mmr/speeches/id/ref_20090825_pmh/source/ref_20090825_pmh.en.pdf

International Monetary Fund, (2012a), "Financial Sector Assessment Program Update – Japan; Oversights and Supervision of Financial Market Infrastructure (FMIs) Technical Note," Available at: www.imf.org

_____ (2012b), "Financial Sector Assessment Program Update – Spain; Oversights and Supervision of Financial Market Infrastructure (FMIs) Technical Note," Available at: www.imf.org

International Monetary Fund, Bank for International Settlements and the Secretariat of the Financial Stability Board, (2009), "Guidance to Assess the Systemic Importance of Financial Institutions, Markets and Instruments: Initial Consideration," Available at: http://www.financialstabilityboard.org/publications/r_091107d.pdf

Monetary Authority of Singapore, (2013), "Supervision of Financial Market Infrastructure in Singapore," http://www.mas.gov.sg/~/media/MAS/About%20MAS/Monographs%20and%20information%20papers/MASMonograph_Supervision_of_Financial_Market_Infrastructures_in_Singapore%202.pdf

SEACEN, Project Team Member Report from India, (2013 a.), Analytical Framework in Assessing Systematic Financial Market Infrastructure: Interdependencies of Financial Market Infrastructure.

SEACEN, Project Team Member Report from Indonesia (2013 b.)

SEACEN, Project Team Member Report from Korea, with Co-author Seungjin Baek, (2013 c.)

SEACEN, Project Team Member Report from Nepal (2013 d.)

SEACEN, Project Team Member Report from Papua New Guinea (2013 e.)

SEACEN, Project Team Member Report from Philippines (2013 f.)

SEACEN, Project Team Member Report from Sri Lanka (2013 g.)

SEACEN, Project Team Member Report from Chinese, Taipei (2013 h.)

SEACEN, Project Team Member Report from Vietnam, with Co-author Anh Hoang Ly (2013 i.)

Abbreviations

BCP	Business Continuity Plan
BIS	Bank for International Settlements
CBLO	Collateralised borrowing and lending obligation
CCP	Central Counterparties
CPSS	Committee on Payment and Settlement Systems
CSD	Central Securities Depositories
FD	Financial Development
FMI	Financial Market Infrastructure
LVPS	Large-value Payment System
PFMI	Principles of Financial Market Infrastructure
PS	Payment System
PTD	Payment Transaction Data
PTM	Project Team Member
RTGS	Real Time Gross Settlement
SEACEN	South East Asian Central Banks
SMD	Stock Market Development
SSS	Securities Settlement System
TR	Trade Repository

Participating Members in this SEACEN Research Project

RBI	Reserve Bank of India
BI	Bank Indonesia
BOK	The Bank of Korea
NRB	Nepal Rastra Bank
BPNG	the Bank of Papua New Guinea
BSP	Bangko Sentral ng Pilipinas
CBSL	Central Bank of Sri Lanka
CBCT	Central Bank, Chinese Taipei
SBV	State Bank of Vietnam.

Transaction Statistics

SN		3	4	5	6	7	8	9	10	11	12	13
1	India: PS is RBI RTGS (fiscal year) US$ Billion (Since March 2004)											
	Value of PS Total Transactions					5436.5	12001.3	13315.3	21336.4	20647.3	22531.8	25880.4
	Money Market (CBLO)					1045.0	2015.6	1921.9	3277.6	2689.9	2327.8	2214.3
	Gsec					790.1	1392.3	1362.1	1895.3	1529.3	1513.3	2204.5
	Interbank					246.9	1429.9	1986.0	6941.4	4284.5	5810.9	7233.2
	Forex					1771.7	3162.7	3688.7	2997.2	4203.9	4632.4	4800.0
	Customer					1582.8	4000.9	4356.6	6225.0	7939.6	8247.5	9428.4
2	Indonesia (US$ Billion)											
	Value of PS Total Transactions	2397	2490	2004	3102	4554	3563	3636	6020	7379	10150	
	Money Market	221	230	301	452	632	373	471	525	596	484	
	Bond Market	1454	1343	626	1072	1683	1164	917	2568	3394	6178	
	Securities Market	10	60	83	134	274	175	175	263	231	222	
	Forex Market	165	230	253	284	432	341	284	374	391	283	
	Other	548	626	742	1161	1533	1511	1788	2290	2767	2983	
3	Korea: PS is BOK-Wire+ (RTGS) US$ Billion											
	Value of PS Total Transactions	18,973	23,649	29,450	33,416	39,633	39,023	36,020	43,730	46,471	49,967	
	Money Market	-	132	192	307	462	1,325	1,415	2,233	4,010	6,837	
	Bond Market	690	1,314	1,616	1,639	1,620	1,523	1,911	2,628	2,760	2,817	
	Securities Market	78	156	246	344	486	440	362	438	569	276	
	Forex Market	-	25	82	158	211	328	387	468	515	518	
	Retail Payment (net settlement)	2890	2583	2364	2723	3400	3598	3641	4210	4416	4163	
4	Nepal											
	Value of PS Total Transactions						NP					
5	Papua New Guinea (in US$ million)											
	Value of PS Total Transactions	5545	5219	5936	6648	10205	12769	12139	13485	18004	20641	15761
	Money Market	658	608	431	178	1781	1150	1240	618	316	651	351
	Bond Market	49	278	506	614	734	853	868	926	1216	1136	1787
	Securities Market	776	693	579	377	331	606	668	573	956	1321	1927
	Forex Market	4062	3638	4420	5480	7360	10159	9364	11368	15517	17533	11696

Philippines

	3	4	5	6	7	8	9	10	11	12	13
Value of PS Total Transactions	613	600	979	2377	4055	5014	3957	4580	7217	8280	7665
Money Market						.3	1.9	1.7	.6	.1	
Bond Market		97.9	1.5	20.2	36.4	42.9	38.9	51.5	117.7	93.7	124.8
Forex Market	6.8		207.7	383.2	594.6	676	691.6	838.5	798.7	795.4	719.8

Sri Lanka

7	3	4	5	6	7	8	9	10	11	12	13
Value of PS Total Transactions	44	131	172	168	196	222	290	431	507	340	
Money Market	38.69	33.21	40.38	33.71	38.40	41.10	47.65	114.75	160.16	65.95	
Bond Market	2.16	2.08	2.25	2.89	3.72	5.84	20.23	7.55	5.30	6.77	
Securities Market	0.76	0.56	1.12	0.98	0.97	0.98	1.25	5.14	4.80	1.68	
Forex Market	3.27	3.76	7.05	10.82	9.41	14.40	11.38	11.18	16.71	13.79	

Chinese Taipei (US$ Billion)

8	3	4	5	6	7	8	9	10	11	12	13
Value of PS Total Transactions	4670	5793	7653	7522	7674	8918	9450	11324	12120	13090	
Money Market	3885	4243	5275	5481	4982	4403	3819	4991	5445	5484	
Bond Market	3673	3700	6891	5225	2852	1905	1190	1344	913	622	
Securities Market	592	716	584	736	1007	835	900	894	891	684	
Forex Market	1838	2580	3009	3911	4634	4846	4111	5115	6013	5893	

Vietnam (in US$ billion)

9	3	4	5	6	7	8	9	10	11	12	13
Value of PS Total Transactions	0.013	0.043	0.076	0.103	0.174	0.347	0.556	0.777	1.331	1.942	2.039

Source: Based on the SEACEN PTM Reports. NP – Not Provided;
Remarks: 3 refers to 2003, etc. up to 13 referring to 2013. For India 7 – 13 refers to 2006/07 – 2012/13.

Chapter 2

ANALYTICAL FRAMEWORK IN ASSESSING SYSTEMIC FINANCIAL MARKET INFRASTRUCTURE OF INDIA

By
Edwin Prabu A.[1]

1. Introduction

A well functioning financial system is seen as an important element for pursuit of economic growth. The functioning of financial markets is aided by the Financial Market Infrastructures (FMIs) which facilitate the clearing and settlement of financial transactions including the payment of funds. FMIs provide central location for price discovery, thereby increasing the liquidity and transparency of markets to market participants, reduce exposure risks through central counterparties (CCPs) and faster settlement of funds through the payment system. Market functioning is dependent on the continuity and orderly operation of the services provided by FMIs (Bank of England). Thus, FMIs play a significant role in the smooth and efficient functioning of financial markets and foster financial stability.

During the financial crisis, FMIs play a very critical role in maintaining the market confidence. "First, FMIs like the central counterparties shift the counterparty risk from participants to themselves, thereby ensuring trust in an environment where participants distrust each other and thus provide the market confidence to carry on transacting. Second, their ability to settle when transactions are due for settlement on account of their risk management practices help in retaining the sanity in the market" (Padmanabhan, 2013). At the same time, the FMIs also concentrate the risk and, if not properly managed, FMIs can be sources of financial shocks, which can be transmitted across financial markets (RBI, 2013). Given the importance of FMIs in the efficient functioning of the financial markets, the study aims to identify the various interdependencies that exist among the FMIs and to analyse risk implications of these interdependencies.

1.1 Stylised and General Information on Indian Economy

India lies wholly in the Northern Hemisphere and the mainland extends between 8°4'N to 37°6' N latitudes and from 68°7' E to 97°25' E longitudes. Countries having a common border with India are Afghanistan and Pakistan to the north-west, China, Bhutan and Nepal to the north, Myanmar and Bangladesh to the east. Sri Lanka is separated from India by a narrow channel of sea formed by the Palk Strait and the Gulf of Mannar[2].

India's population as on 1 March 2011 stood at 1,210 million (623.7 million males and 586.5 million females). India's population constitutes about 17.5% of the world population, even though it accounts for only 2.4% of the world surface area[3]. The population density of India defined as the number of persons per square km in 2011 was 382 per square km. The other key indicators are given in Appendix Table 1.1.

1.2 Exchange Rate Policies in India

In India, the market-determined exchange rate system was introduced in March 1993 and thereafter, the exchange rate is largely determined by demand and supply conditions in the market (RBI, 2007). India achieved full current account convertibility in August 1994, when India accepted the obligations under Article VIII of the Articles of Agreement of the IMF.

"The exchange rate policy for India has been guided by the broad principles of careful monitoring and management of exchange rates with flexibility, without a fixed target or a pre-announced target or a band, while allowing the underlying demand and supply conditions to determine the exchange rate movements over a period in an orderly way" (Mohan, 2006). "Subject to this predominant objective, the exchange rate policy is guided by the need to reduce excess volatility, prevent the emergence of destabilising speculative activities, help maintain adequate level of reserves, and develop an orderly foreign exchange market" (Jalan, 1999).

---

2. http://www.indianembassy.hr/pages.php?id=11.
3. Data accessed from http://www.censusindia.gov.in/2011census/censusinfodashboard/stock/profiles/en/IND_India.pdf.

1.3 Macroeconomic Trends in the Indian Economy

India has traversed a long way since the economic reforms started in the early 1990's, which focused on three pillars, i.e., liberalisation, privatisation and globalisation. Before the global financial crisis, for the period 2003-08, the average growth was higher at 8.7%, but due to the crisis, the growth dropped to 6.7% in 2008-09. Thereafter, the growth recovered and averaged around 8.8% for 2009-10 and 2010-11 period. However, in recent period, the growth has moderated and reached 4.5% in 2012-13, the lowest in the current decade so far. The inflation which was also lower during the pre-crisis period (2003-08) has increased for the period (2008-13) (Table 1).

Table 1
Key Macroeconomic Indicators for India
(Percent)

Indicators	2003-2008 (Average)	2008-09	2009-10	2010-11	2011-12	2012-13	2008-13 (Average)
GDP Growth	8.7	6.7	8.6	8.9	6.7	4.5	7.1
WPI Inflation	5.5	8.1	3.8	9.6	8.9	7.4	7.6
Repo Rate (Policy Rate)	6.7	7.4	4.8	5.9	8.1	7.9	6.7
Exchange Rate (Rs per USD)	44.13	45.92	47.42	45.58	47.92	54.41	48.21

Source: Handbook of Statistics for Indian Economy.

The financial sector has also undergone significant changes during the period not only to support the rapid growth but also to do so without any disruptive episodes. The daily average value traded in the collateralised borrowing and lending obligation (CBLO), a segment of the money market, has increased substantially from Rs. 101 billion in 2005-06 to Rs. 416 billion in 2012-13. In the government securities market, the liquidity in the secondary market has increased significantly from Rs. 9 billion in February 2002 to Rs. 344 billion in March 2013 (Khan, 2013b). The market capitalisation of national stock exchange (NSE) has also increased substantially from approximately Rs. 28.1 trillion in 2005-06 to Rs. 62.4 trillion in 2013-14.

The exchange rate, in general, showed two-way movements reflecting the domestic and external factors. At the onset of the crisis, the Rupee appreciated on account of the huge capital flows. It touched a high of 39.27 in January 2008. Due to the global financial crisis, the appreciation trend reversed and Rupee depreciated to reach Rs. 52.06 in March 2009. Thereafter, the Rupee recovered and for almost two years between November 2009 and August 2011, remained range-bound at Rs. 44-47 levels. However, thereafter, the Rupee exhibited volatile movements and depreciated against US dollar on account of domestic concerns, such as the widening current account and fiscal deficits, and global uncertainties, such as euro zone crisis, Federal Reserve's comments about exit from quantitative easing, etc. (Chart 1).

1.4 FMIs Performance During 2008 Global Financial Crisis

The Indian FMIs have stood the test of time by settling obligations whenever they were due and providing market participants enormous confidence to transact business without the risk of defaults and failures during periods of uncertainty and volatility (Khan, 2013a). All the FMIs including Real Time Gross Settlement (RTGS) system functioned smoothly during the global financial crisis, even though Indian financial markets were affected by it.

Chart 1
Movements in the Indian Exchange Rate Market
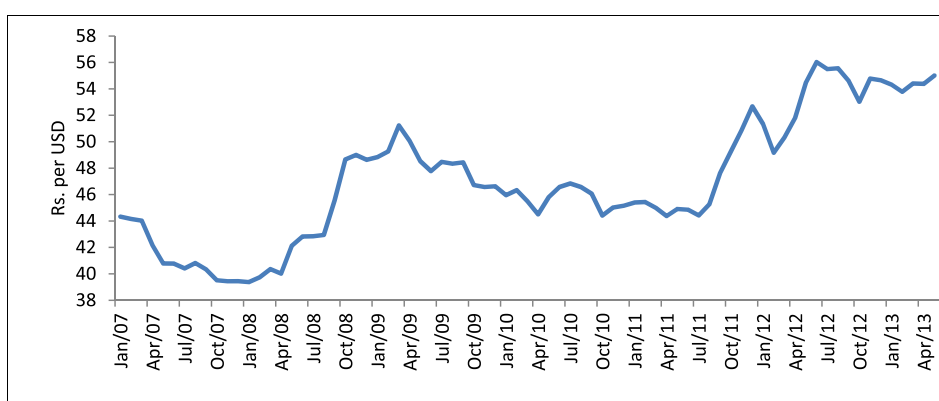
Source: Handbook of Statistics for Indian Economy.

1.5 Objective of Project Paper

Given the importance of FMIs in the economy, the key objective of this study is to review the functioning of the FMIs during the crisis period as well as to assess the complex relationship and interdependencies between the FMIs in order to understand the possible systemic risks arising from such interconnections. Thus, the study aims to assess the interconnectedness among the FMIs in India and to provide important policy implications in terms of counteracting vulnerability to financial shocks and contagion.

1.6 General Outline of Project Paper

This project team paper for India is a part of the SEACEN's research project on the Analytical Framework in Assessing Systemic Financial Market Infrastructure. Section 1 presents the objective of the study and an introduction to the Indian economy, providing trends in some key economic indicators. Section 2 provides a detailed description of the country's FMIs, identifying the interdependencies of the FMIs within the economy and the oversight and supervisory function with respect to each of the FMIs. Section 3 presents the financial statistics relating to the economy and the FMIs and Section 4 deals with the analysis of the interdependencies of the FMIs. Section 5 concludes the study with the recommendations for mitigation of systemic risks arising from interdependencies between the FMIs.

2. Financial Market Infrastructures in India

The overview of Indian FMIs can be broadly categorised into payment systems including RTGS, Central Securities Depositories (CSDs), Securities Settlement Systems (SSSs) and CCP systems (Chart 2). In India, the payment and settlement system (PSS) is designated as FMI as and when it reaches systemic importance based on the various parameters, such as: (i) volume and value of transactions; (ii) share in the overall payment systems; (iii) markets in which it is operating; (iv) degree of interconnectedness and interdependencies; and (v) criticality in terms of concentration of payment activities, etc. (RBI, 2013).

Chart 2
Overview of FMIs in India
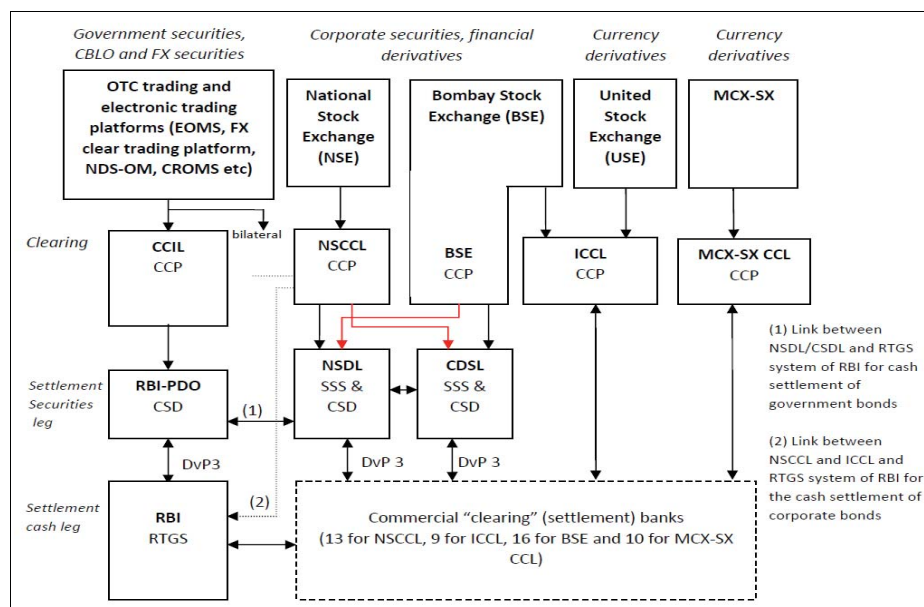
Source: IMF 2013.

2.1 General Policy and Regulation Framework of FMIs in India

2.1.1 *Payment and Settlement System*[4]

The payment and settlement systems in India are regulated by the Payment and Settlement Systems Act, 2007 (PSS Act), legislated in December 2007. The PSS Act as well as the Payment and Settlement System Regulations, 2008 framed thereunder came into effect from August 12, 2008. In terms of the PSS Act 2007, no person other than the Reserve Bank of India (RBI) can commence or operate a payment system in India unless authorised by RBI. Deriving its powers under the PSS Act 2007, the RBI is responsible for authorisation of various payment system operators along with regulation and oversight of the PSSs.

The Board for Regulation and Supervision of Payment and Settlement Systems (BPSS), a sub-committee of the Central Board of the RBI is the highest

---

4. The sub-section is taken from http://www.rbi.org.in/scripts/paymentsystems.aspx

policymaking body on payment systems in the country. The BPSS is empowered to authorise, prescribe policies and set standards for the regulation and supervision of all the PSSs in the country. The Department of Payment and Settlement Systems of the RBI serves as the Secretariat to the Board and executes its directions.

2.1.2 Securities Market Infrastructures[5]

The Securities and Exchange Board of India Act, 1992, provides for the establishment of the Board (SEBI) and confers powers on the SEBI to regulate the securities market by registering and regulating all market entities such as stock exchanges and depositories, etc., to conduct enquiries, audits and inspections of such entities and to adjudicate offences under the Act.

Sections 20 and 21A of the RBI Act, 1934 mandate the RBI to act as a debt manager to the central and state governments. Earlier, the Public Debt Act, 1944 (PD Act, 1944) and the current Government Securities Act, 2006 which superseded the PD Act, 1944 from December 1, 2007 provided the framework for regulating transactions in the government securities market.

Section 45W of the RBI Act, 1934 empowers the RBI to regulate, determine policy and give directions to all or any agencies dealing in securities, money market instruments, foreign exchange, derivatives or other such instruments as the RBI may specify.

The Securities Contract Regulations Act, 1956 (SCRA), confers powers on the government of India to regulate and supervise all stock exchanges and securities transactions. This Act also applies to government securities. The central government has delegated its powers under the act to the RBI. These powers relate to contracts in government securities, money market securities, gold-related securities and derivatives, as well as repurchase agreements in bonds, debentures, debenture stock, securitised debt and other debt securities. All other segments of the securities market are regulated by the SEBI through powers conferred on it by the SEBI Act and the SCRA and through powers delegated to it by the central government under the SCRA.

―――――――――――

5.   The sub-section is accessed from BIS (2011).

The Depositories Act, 1996, paved the way for the establishment of securities depositories that support the electronic maintenance and transfer of ownership of securities in a dematerialised form, facilitating faster settlement in the securities market.

2.2 Stylised Facts of FMIs in India

2.2.1 *Payment and Settlement System*

The PSS encompasses the whole lot of payment systems including the cheque-based clearing systems, Electronic Clearing Service (ECS) suite, National Electronic Funds Transfer (NEFT) System, RTGS System, other electronic products like Cards (Debit/Credit/Prepaid), Mobile banking, Internet banking, etc., the inter-institutional Government Securities clearing and the inter-bank foreign exchange clearing[6]. For these payment systems, central bank money is used as a settlement asset, which has reduced both credit and liquidity risk in the systems. The RTGS system is both a payment and settlement system, while the rest of the systems are only payment systems. Hence, in this report we focus mainly on the RTGS system, as it processes all the systemically important payments, including securities settlement, forex settlement and money market settlements, and is identified as a systemically important payment system for India.

2.2.1.1 *Real Time Gross Settlement System*

The RTGS system is operational in India since March 2004. It settles all interbank payments and customer transactions above Rs. 0.2 million. There are about 160 direct participants in the RTGS. The participants include banks, financial institutions, primary dealers and clearing entities. The number of RTGS-enabled bank branches has crossed 80,000. The RTGS volume and value of gross transactions is growing very fast (Chart 3). The recent financial sector assessment programme (FSAP) report on India by International Monetary Fund (IMF) and World Bank indicated that the RTGS system in general observes all the core principles for systemically important payment systems (CPSIPS) (IMF 2013).

The RBI on October 19, 2013 introduced the new RTGS system with improved functions and features, such as advanced liquidity management facility, extensible mark-up language (XML) based messaging system conforming to

---

6. http://www.rbi.org.in/scripts/paymentsystems.aspx

ISO 20022, and real time information and transaction monitoring and control systems. The new RTGS system is expected to significantly improve the efficiency of the Indian financial markets.

Chart 3
Trends in the RTGS system
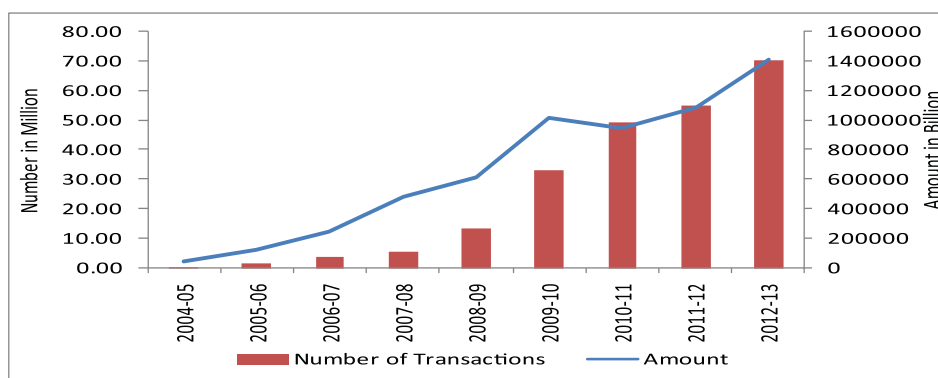
Source: Various Issues of RBI Monthly Bulletin.

2.2.2   Central Securities Depositories/Securities Settlement Systems

2.2.2.1   Public Debt Office, RBI

The Public Debt Office (PDO), RBI is the CSD for government securities. All the primary and secondary market transactions of the Government securities are reflected in the books of the RBI (in electronic book-keeping form). In February 2002, the RBI set up an electronic trading and reporting platform for Over-the-Counter (OTC) government securities transactions called the Negotiated Dealing System (NDS) and Negotiated Dealing System (RBI-NDS-GILTS-Order Matching Segment, NDS-OM) on August 1, 2005 (BIS, 2011). The NDS-OM system is anonymous and purely order-driven, with all orders being matched by strict price/time priority and the executed trades then flowing directly to Clearing Corporation of India Ltd (CCIL), which becomes the CCP to each trade on the system (BIS, 2011). Currently, NDS-OM accounts for around 90% of the trading volume in Government securities. Given its criticality in the Government securities market, the RBI has designated NDS-OM as an FMI (RBI, 2013).

2.2.2.2 National Securities Depository Ltd. and Central Depository Services Ltd.

The securities settlement in equities and derivatives are effected through two depositories, the National Securities Depository Ltd. (NSDL) and Central Depository Services Ltd. (CDSL). The NSDL was established in August 1996 and the CDSL was established in February 1999 and promoted by the NSE and Bombay Stock Exchange (BSE), respectively, with major banks as the shareholders in both the depositories. The fund settlement takes place in the designated settlement banks. In the case of corporate bonds, the Indian Clearing Corporation Limited (ICCL) and the National Securities Clearing Corporation Ltd. (NSCCL) effect the funds settlement in the RTGS and the securities settlement in the two depositories (BIS, 2011). The two securities depositories also maintain Subsidiary General Ledger (SGL) accounts with the RBI to facilitate the dematerialised settlement of government securities traded in the retail debt segment of the NSE and BSE (BIS, 2011).

2.2.3 Central Counterparties

2.2.3.1 Clearing Corporation of India Limited

The CCIL was set up in April 2001 by banks, financial institutions and primary dealers and functions as a CCP for the clearing and settlement of trades in foreign exchange, Government securities and other debt instruments. That is, the CCIL acts as a CCP in the Government securities, CBLO, US$-INR and forex forward segments. It provides guarantee to the settlement of securities and foreign exchange transactions of the counterparties by interposing itself as the central counterparty to all trades by a process called as 'Novation' (BIS, 2011). By this, even though the counterparty risk is not eliminated, it is managed by redistribution as players' bilateral risk is replaced by standard risk to the CCP. In order to provide such guarantee and also minimise the risks that it exposes itself to, the CCIL follows specific risk management practices, which are also international best practices[7]. It also provides non-guaranteed settlement in the rupee-denominated interest rate derivatives as well as to the non-guaranteed settlement of cross-currency trades to banks in India through continuous linked settlement (CLS) bank by acting as a third-party member of a CLS Bank settlement member[8]. The RBI recognised the CCIL as the critical FMI for India in July 2013.

---

7.   http://www.rbi.org.in/scripts/paymentsystems.aspx

8.   https://www.ccilindia.com/CLS/Pages/Introduction.aspx

2.2.3.2 *Clearing Houses in the Equity and Derivative Markets*[9]

The BSE and NSE, the two major stock exchanges, account for the vast majority of equity transactions in the country. Both the BSE and NSE have their own trading houses. The BSE's electronic trading platform for equities is known as BSE On-line Trading (BOLT). The BOI Shareholding Limited (BOISL) is the BSE's clearing house for clearing and settling funds and securities on its behalf. The ICCL also functions as a clearing corporation for the BSE. At present, it undertakes clearing and settlement for the BSE's mutual funds and corporate debt segments. The NSE's electronic trading platform is known as the National Exchange for Automated Trading (NEAT). The NSCCL is the clearing corporation for NSE and carries out the clearing and settlement of trades executed in the equities and derivatives segments of the NSE. The BOISL and NSCCL effect the securities pay-ins and payouts through two depositories, NSDL and CDSL. In the MCX Stock Exchange Limited (MCX-SX) stock and derivatives markets, the clearing and settlement of deals in multi-asset classes is done by the MCX-SX Clearing Corporation Limited (MCX-SXCCL).

2.2.4 *Trade Depositories*

The CCIL acts as a trade depository for OTC interest rate and forex derivative transactions in India. The RBI has mandated reporting of inter-bank Rupee Forward Rate Agreement (FRA), Interest Rate Swap (IRS) trades, inter-bank foreign exchange derivatives and all/selective trades in OTC foreign exchange and interest rate derivatives between the Category–I Authorised Dealer Banks/market makers (banks/PDs) and their clients to the reporting platform developed by the CCIL[10]. Further, the RBI has stated that the CCIL as a trade depository would be regulated using the principles of FMIs (PFMIs).

2.3 Mapping the Interdependency of FMIs in India

In the Indian context, the payment system and other market-related FMIs are increasingly interlinked through payment and settlement flows, operational processes and risk management procedures, etc. Since all the market-related FMIs cash settlement is done through payment and settlement system particularly through the RTGS system, if there are any disruptions in the payment and settlement systems or in any single market-related FMIs, there is an increasing possibility that the entire FMIs infrastructure will be affected.

---

9. The subsection is taken from BIS 2007.

10. http://www.rbi.org.in/scripts/NotificationUser.aspx?Mode=0&Id=7050

As a first step, we have presented the interdependency of FMIs by mapping the market-related FMIs to the PSSs (Table 2).

Table 2
Mapping the Interdependency of FMIs

SN	Markets		Clearing	Settlement	
				Securities/currency	Funds
1	Money Market	CBLO	CCIL	CCIL	RTGS
2	Bond Market (Government Securities)	Primary Markets	Bids flow directly to the RBI	PDO, RBI	RTGS
		Secondary Markets	CCIL	PDO, RBI	RTGS
3	Forex Market	USD-INR	CCIL	USD settlement through CCIL's correspondent bank in New York	RTGS
4	Securities Market	Equities	NSCCL/BOISCL	NSDL/CDSL	Settlement Banks
		Corporate Bonds	NSCCL/ICCL	NSDL/CDSL	RTGS

Source: Various issues of RBI Annual Report and CPSS – Red Book, 2011

2.3.1   Interdependency of FMIs in India

In India, there is strong evidence of system- and institution-based interdependencies based on the payment systems and related settlement flows, operational processes and risk management procedures followed by FMIs (BIS, 2008 and RBI, 2011a).

2.3.1.1   System-based Interdependencies

System-based interdependencies in India arise from direct cross–system relationships, i.e., relationships between the Reserve Bank and CCIL-operated systems, as well as with the SEBI-regulated clearing corporations which settle the funds leg of the corporate bond transactions in the RTGS system (RBI, 2011a).

2.3.1.2 *Institution-based Interdependencies*

The institution-based interdependencies result from indirect relationships between two or more systems through a common financial institution. In India, this is highly evident as all the major financial institutions are participants in all the systems and some major participants act as settlement banks for fund settlements for some other participants in the CBLO and Government securities segments (RBI, 2011a). Further, some major banks in the CCIL and Reserve Bank operated systems acts as a settlement banks for the equity markets, while some provide funds and securities lines of credit to the CCIL in segments in which they are also major players (RBI, 2011a).

2.3.1.3 *Environmental Interdependence*

The environmental interdependencies in India can arise out of operational factors such as a financial institution acting as clearing bank for a system (as in the case of banks acting as clearing banks for the equity market CCPs) or because of providing common infrastructures (the INFINET network operated by the Institute for Development & Research in Banking Technology (IDRBT)) (RBI, 2008).

2.4 Oversight and Supervisory Authority of FMIs in India

The oversight and supervisory authorities of FMIs in India are broadly classified in Table 3. Both the RBI and SEBI, being members of the Committee on Payment and Settlement Systems (CPSS) and International Organisation of Securities Commissions (IOSCO), respectively, are committed to the adoption and implementation of the new CPSS-IOSCO standards of "Principles for Financial Market Infrastructures" (PFMIs) in their regulatory functions of oversight, supervision and governance of the key FMIs under their purview.

Table 3
Oversight and Supervisory Authority of FMIs in India

SN	FMI Type	Owner-ship	FMI (name)	Authorisation, Designation, or Licensing	Oversight	Supervision	On-site Inspection
1	Payment System	Public	RTGS	-	RBI	-	-
2	CSD/SSS						
	2.1 Government Securities	Public	PDO, RBI & NDS-OM	-	RBI	-	-
	2.2 Equity and Debt Instruments	Private	NSDL and CDSL	SEBI	SEBI	SEBI	-
3	CCP						
	3.1 Money (CBLO), Govt and Forex Market	Private	CCIL	RBI	RBI	RBI	RBI
	3.2 Stock, Corporate bond Market and Exchange Traded Derivatives						
	(i) BSE	Private	ICCL	SEBI	SEBI	SEBI	-
	(ii) NSE	Private	NSCCL	SEBI	SEBI	SEBI	-
	(ii) MCX-SX	Private	MCX-SXCCL	SEBI	SEBI	SEBI	-
4	Trade Depositories						
	OTC Derivative Trades (Interest Rate and Forex)	Private	CCIL	RBI	RBI	RBI	RBI

Source: Various Publications of RBI and SEBI.

3. Financial Statistics in India

"The global financial crisis has brought to the fore the importance of interconnections – amongst the banking system, financial markets, and payment and settlement systems. It has underlined the fact that focusing on only one part of the financial system can obscure vulnerabilities that may prove very important from the perspective of systemic stability" (Chakrabarty, 2012). In order to understand the strength of interconnectedness between the FMIs, a preliminary analysis was conducted on total flows in the RTGS as well as disaggregation of the total flows into the RTGS system from the four market-related FMIs, namely, money market, government securities market, forex market and securities market for India.

3.1 FMI Statistics in India

As noted earlier in Section 2, the RTGS is a systematically important financial market infrastructure in India. In this section, we will analyse the RTGS system and try to ascertain the interdependence of the other FMIs, i.e., Money market,

G-sec market, Forex market and the Bond market to the RTGS system. However, in India, only the clearing corporations in the capital market, such as ICCL and NSCCL, settle the funds leg of the corporate bond transactions in the RTGS. In this note, the interbank settlement also includes settlement from the corporate bond markets. In the stock market, while the securities leg of transaction is settled in the NSDL and CDSL, the cash settlement is executed in one of the commercial banks that acts as the clearing banks for the exchanges (i.e., the NSCCL has 13 banks for the fund clearing in NSE market, ICCL has 16 banks for BSE market and MCX-SX CCL has 15 banks for MCX-SX market). Since the cash settlement takes place in the commercial banks, we were not able to exactly find the cash settlement funds emanating from the stock markets to the RTGS system. In simple terms, the stock market cash settlements are taking place in commercial money while other market cash settlements are taking place in central bank money.

3.1.1 Total number of Participants/Volume in the RTGS System

The RTGS system has been in operation in India since March 2004 and has been exhibiting rapid growth, not only in terms of volume and value of transactions but also in the coverage of branches. The number of participants in the RTGS was only 110 in June 2006, increased to 163 in June 2013. Further, in terms of bank branches included in the RTGS, there has been rapid growth, as only 21,916 bank branches had been covered in June 2006 which increased to more than 80,000 bank branches in June 2013. The detailed participant data for the RTGS as well as for the other market-related FMIs are given in Table 4.

Table 4
Number of Participants in the FMIs in India
(End of Year)

	2007	2008	2009	2010	2011
RTGS					
Number of participants	105	106	119	120	128
Direct participants	105	106	119	120	128
Banks	95	97	106	107	114
Reserve Bank of India	1	1	1	1	1
Other direct participants*	9	8	12	12	13
Government Securities Market					
Total number of participants	149	149	149	168	182
Reserve Bank of India	*1*	*1*	*1*	*1*	*1*
Central counterparties (CCPs)	*1*	*1*	*1*	*1*	*1*
Banks	*92*	*92*	*92*	*107*	*108*
Others	*55*	*55*	*55*	*59*	*72*
Capital Markets					
NSE					
Total number of participants	1,075	1,227	1,136	1,373	1,376
Reserve Bank of India	*nap*	*nap*	*nap*	*nap*	*nap*
Central counterparties (CCPs)	*nap*	*nap*	*nap*	*nap*	*nap*
Banks	*nav*	*nav*	*nav*	*nav*	*nav*
Others	*nav*	*nav*	*nav*	*nav*	*nav*
BSE					
Total number of participants	1,387	1,015	1,396	1,326	1,371
Reserve Bank of India	*nap*	*nap*	*nap*	*nap*	*nap*
Central counterparties (CCPs)	*1*	*1*	*1*	*1*	*1*
Banks	*10*	*11*	*12*	*11*	*11*
Others	*1,376*	*1,003*	*1,383*	*1,314*	*1,359*

Note: *: Includes Deposit Insurance and Credit Guarantee Corporation of India, nav: not available and nap: not applicable.
Source: Statistics on Payment, Clearing and Settlement Systems in the CPSS Countries (BIS, 2011).

3.1.2 Total Number of Volume in the RTGS System

The number of transactions/volume in the RTGS system has grown many folds over the period 2006-2013. In 2006-07, the volume was only 3.88 million, but in 2012-13, the volume has increased to 68.52 million, indicating the efficiency of the RTGS system, as the increased volumes could be handled smoothly without any problems. Much of the increase in the number of transactions has come from customer transactions, i.e., individual customers transferring money in the RTGS to other individuals (Chart 4). Among the market-related FMIs, interbank

which includes corporate bond market as well as forex market had a higher share of transactions in the RTGS than the government and money market, i.e., the CBLO market operated by the CCIL (Chart 4).

Chart 4
Volumes in the RTGS Based on Market-type Classification
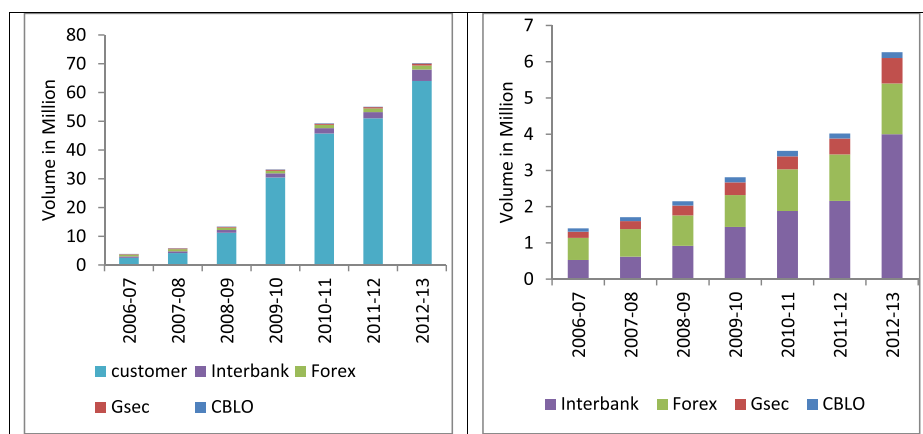
Source: Various Issues of RBI Monthly Bulletin.

3.1.3 Market Value of Transactions in RTGS on an Annual Basis

The value of transactions in the RTGS system has also increased over the period of time. In 2006-07, the value of transaction was US$ 5,437 billion, which increased to US$ 22,664 billion in 2012-13. The RTGS processed transactions to a settlement value of around Rs. 8 trillion on March 28, 2013, which is the highest value settled through the RTGS on a business day. The tremendous increase in the value of transactions operated under the RTGS system shows the efficient functioning of the system. As in the case of volumes, much of the increase in the value of transactions has come from customer transactions (Chart 5). Among the market- related FMIs, interbank which includes corporate bond market and forex market had a higher share of the value of transactions in the RTGS than the government and money market, i.e., the CBLO market operated by CCIL (Chart 5).

Chart 5
Market Values Traded in the RTGS Based on
Market-type Classification
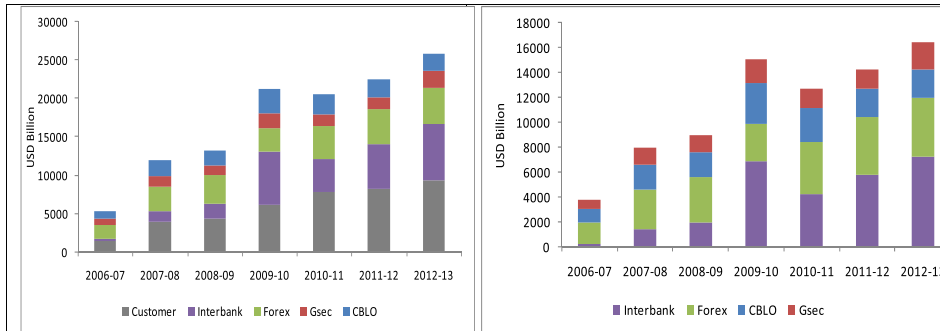
Source: Various Issues of RBI Monthly Bulletin.

3.1.4 Cross-border Settlements

The CCIL acts as a CCP for the foreign exchange segment since November 2002. While the settlement of the INR obligations takes place in members' accounts with the RBI, the settlement details of the US$ leg are sent to the CCIL's correspondent bank in New York, through which the US$ pay-ins to the CCIL's nostro account take place (BIS, 2011). The CCIL also offers a direct debit facility (using a SWIFT MT 300 message) for the US$ leg in order to further reduce members' transaction costs (BIS, 2011). Since 2002, the CCIL's transaction volumes in forex market have grown to 1.4 million trades in 2012-13, representing a total transaction value of more than US$ 4,830 billion on a gross basis without netting (Chart 6).

Chart 6
Foreign Exchange Transactions
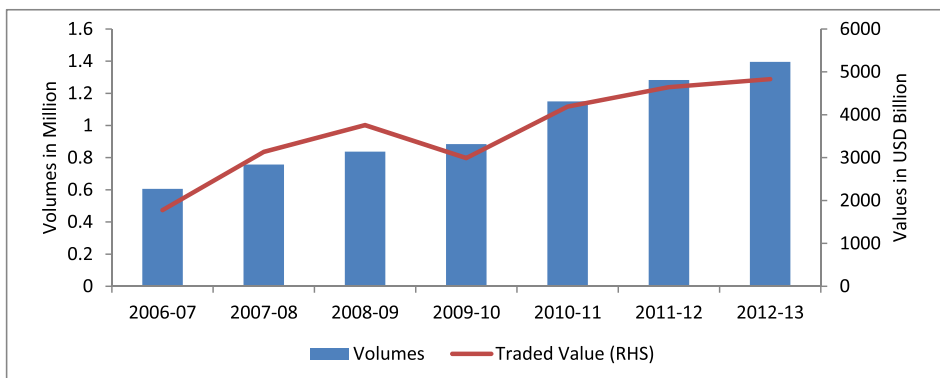
Source: Various Issues of Rakshitra, CCIL.

42

Even though the gross forex settlement has grown over time, the cross-border risk is minimised through multilateral netting basis through a process of novation by the CCIL. The netting of funds has significantly reduced individual funding requirements of every member as well as reduction in liquidity risk. The netting achieved in forex settlement has been increasing over the period indicating better liquidity management (Table 5). For the financial year 2012-13, the US$-INR deals (including forwards) worth US $ 4.83 trillion was settled with exchange of only US $ 0.22 trillion. During the financial crisis, wherein forex liquidity lines had dried up, the Indian banks did not face much of liquidity and funding shortages mainly due to the multilateral netting basis (Rajaram, et al., 2012).

As stated earlier, the CCIL also provides non-guaranteed settlement of cross-currency trades to banks in India through a CLS bank by acting as a third-party member of a CLS Bank settlement member. The CLS, which is a systemically important financial market utility, has reduced significantly the settlement risk in international forex market by using "payment-versus-payment" mechanism, where transactions are settled on a gross basis, whereas funding is done on a net basis. The settlement procedure adopted by the CCIL is on similar lines as that of a CLS bank and the CCIL provides settlement of foreign exchange transactions through a CLS settlement bank, namely, the Royal Bank of Scotland (RBS) in London.[11]

Table 5
Netting Factor in Forex Market (INR_US$ and Forwards)
(US$ Billion)

Settlement Period	Gross	Net	Netting Factor
2006-07	1777.0	171.8	90.33
2007-08	3133.7	239.2	92.37
2008-09	3758.9	209.8	94.42
2009-10	2989.0	177.1	94.07
2010-11	4191.0	212.3	94.94
2011-12	4642.6	214.7	95.37
2012-13	4830.9	222.5	95.30

Source: Rakshitra, CCIL, November 2013.

---

11. https://www.ccilindia.com/CLS/Pages/SettlementProcedure.aspx

3.1.5   Market Value of Transactions in RTGS on a Monthly Basis

In terms of monthly trends too, the interbank market including corporate bond market settlements has been higher (Chart 7). The value of forex settlement has grown over the period of time except for a slight moderation seen in the 2008-09 to 2009-10 aftermath of the global financial crisis. Both money markets, i.e., the CBLO and Government securities, in general, showed an increasing trend. Thus, the above indicates that the Indian FMIs, including the RTGS system, have functioned smoothly during the global financial crisis, even though the value of transactions from the forex market showed some moderation.

Chart 7
Market Values Traded in the RTGS Based
on Market-type Classification
(Monthly)
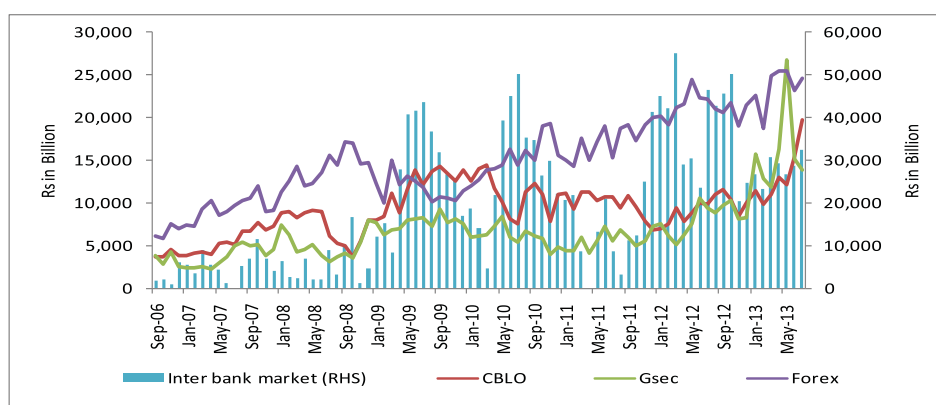
Source: Various Issues of RBI Monthly Bulletin.

3.2 Interdependencies in the FMIs in India

In India, as noted in Section 2, there are mainly two types of interdependencies seen in the FMIs, i.e., system-based interdependencies and institution-based interdependencies. The system-based interdependencies arises from direct cross–system relationships, i.e., relationships between the Reserve Bank and CCIL operated systems, as well as with the SEBI-regulated clearing corporations which settle the funds leg of the corporate bond transactions in the RTGS system. In Chart 8, we can see that all the market-related FMIs fund settlements are directly and indirectly connected to the RTGS system. The connections between the markets-related FMIs and the RTGS payment system are shown red arrow.

Chart 8
System-based Interdependencies in the Indian FMIs
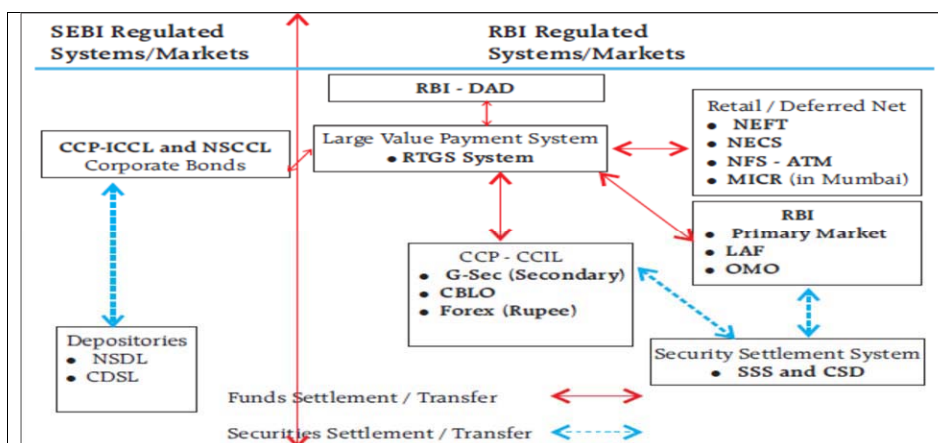
Source: Financial Stability Report, RBI, June 2011.

Institution-based interdependencies arise from indirect relationships between two or more systems through a common financial institution. In India, this is highly evident as all the major financial institutions are participants in all the systems (Chart 9). As stated earlier, some major banks also act as settlement banks for fund settlement for the other participants in the CBLO and government securities segments as well as for the equity markets.

Chart 9
Common Participants in Various Payment and Settlement Systems
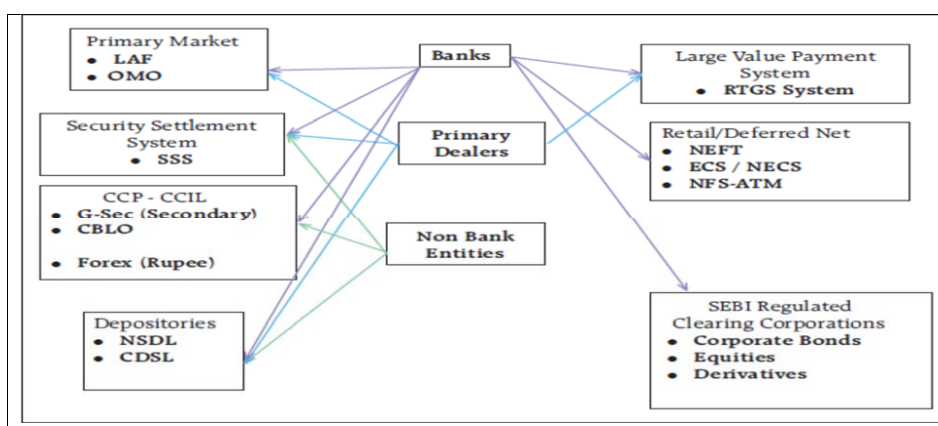
Source: Financial Stability Report, RBI, June 2011.

3.3 Financial-related Development Indicators in India

In this section, we present a comparison of the key financial indicators for the Indian economy before and after the crisis.

3.3.1 Financial Development Indicators

All the financial market indicators, viz. Liqliab, commbank and Bankcred have shown an increasing trend during the post-crisis period when compared with the pre-crisis period (Chart 10).

Chart 10
Average Financial Market Indicators
(Pre-crisis: 2003-08 and Post-crisis: 2008-13)
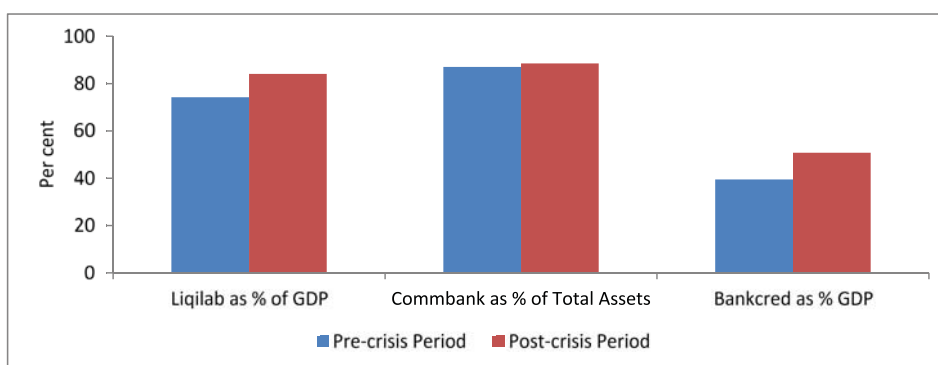
Note: *Liqliab* - The sum total of currency plus demand and interest-bearing liabilities of commercial bank and non-banks divided by nominal GDP; *Commbank* - The total asset of commercial banks divided by sum of commercial bank and central bank assets; and *Bankcred* - The ratio of total credit of commercial banks and other deposit-taking banks to the private sector by nominal GDP.
Source: Financial Stability Report, RBI.

3.3.2 Stock Market Development Indicators

The average market capitalisation as a per cent of GDP for both BSE and NSE has increased during the post-crisis period when compared to the pre-crisis period. However, both the value trades as a per cent of GDP and turnover ratio have declined during the post-crisis period when compared to the pre-crisis period (Chart 11).

Chart 11
Average Stock Market Indicators
(Pre-crisis: 2003-08 and Post-crisis: 2008-13)
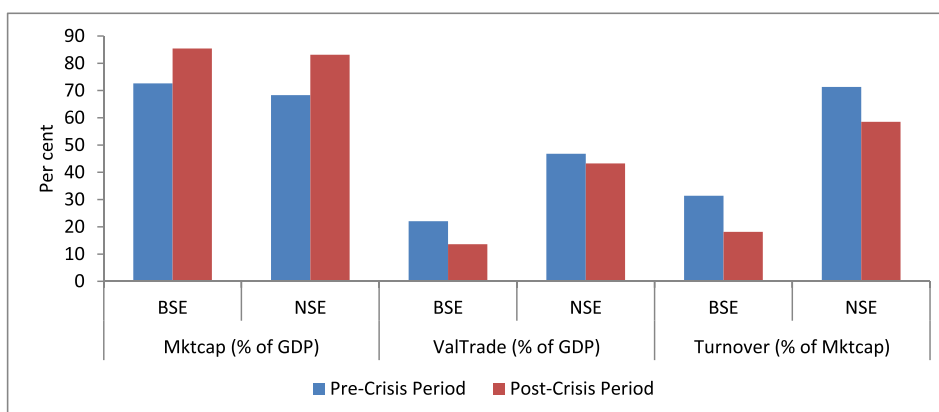
Note: *MktCap* - Total value of stocks in the domestic market divided by GDP; *ValTrade* - Total Value of stock being traded by GDP; and *Turnover* - Total value of stocks being traded divided by the total value of stocks listed in the domestic market.
Source: Handbook of Statistics, SEBI.

4. Analysis

Since the PSS forming the major part of the FMI plays a vital role in ensuring financial stability, we analyse the functioning of the RTGS system in India. Overall, the PSS infrastructure in India including the RTGS system, continued to perform without any major disruptions. The broad policy direction of the Reserve Bank, which has the legislative authority to regulate and supervise the PSS in the country, is for migrating an increasing proportion of all payment transactions, especially the large value / wholesale transactions, to the electronic payment products (RBI, 2013). In this regard, we also highlight certain issues to further improve the functioning of the FMIs in India.

4.1 Analysis of 2008 Global Financial Crisis

During the global crisis, the Indian financial markets were affected, as the reversal of capital flows led to equity market losses and currency depreciation (Mohanty, 2009). The RTGS system comprising of the CCIL-operated system and inter-bank transfers continued to perform without any major disruptions during and in the aftermath of the global financial crisis in 2008 (Chart 12). All the FMIs have settled their obligations and provided the market participants enormous confidence in transacting business without the risk of defaults and failures during the global financial crisis.

47

Chart 12
Value of Transactions in the RTGS System
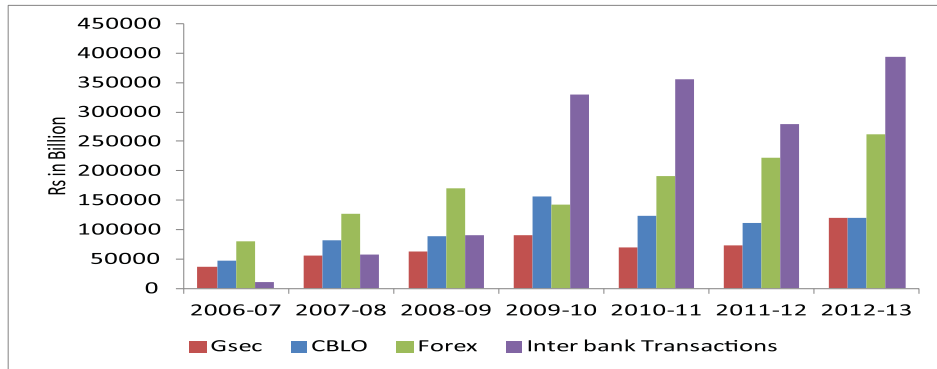
4.2 Analysis of RTGS Network System

The structure of the PSS networks has important implications for financial stability. Network analysis helps in understanding the relationships among the financial institutions and markets, which in turn helps in assessing the risks and vulnerabilities of the financial system as a whole (Chapman, et al., 2011). In general, a less tiered network structure is relatively more stable, than the multi-tiered structure of PSS. The analysis by the RBI's Financial Stability Report, December 2011, revealed that the network of the RTGS system is relatively stable. The analysis of the network of the RTGS system on different dates spanning a year (Chart 13) indicates a relatively low level of network tiering in the RTGS System (effectively only two tiers). The banks that are in the core are the larger participants in the system and these core participants have remained mostly the same over the period.

Chart 13
Network of Banks in the RTGS System
(Two Separate Dates)
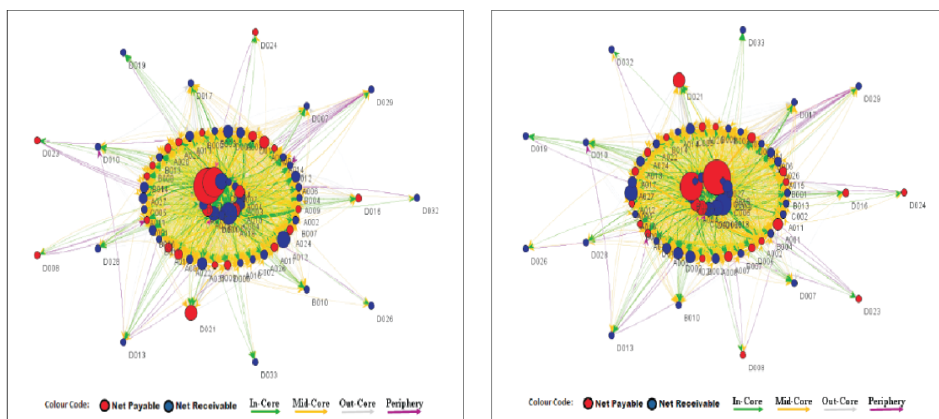
Source: Financial Stability Review, RBI, December 2011.

Even though, the PSS in India is robust, there are certain risks inherent in the functioning of the CCPs which needs to be monitored.

4.2.1 Exposure of Equity Clearing Corporations to Banks

The Clearing corporations offering guaranteed settlement typically maintain a Settlement Guarantee Fund (SGF) in addition to collecting transaction-based margins from the members. The CCIL primarily accepts government securities as contribution to the SGF, while the equity clearing corporations also accept bank guarantees and securities (which may in turn be issued by banks) as SGF Fund. This exposes the clearing corporations to the banks issuing such guarantees /securities, both directly and indirectly. The associated risks can assume systemic proportions in case of bank failures. Exposure norms in this context have been prescribed by the SEBI and also internally by the National Stock Clearing Corporation (NSCC). Nonetheless, the trends in this respect warrant monitoring (RBI, 2011c).

4.2.2 Concentration Risk in Designated Settlement Banks Model

The interconnection of institutions in the PSSs may lead to concentration risks, as few select banks act as liquidity backstop providers, settlement banks and large participants in different market segments. Important in this context is

49

the system of settlement of the transactions of associate members of the CCIL through the Designated Settlement Banks (DSBs) (the transactions of direct members of the CCIL are settled in the Reserve Bank). The distribution of associate members with the different DSBs (Table 6) points to evident concentration risks as any failure of settlement in a DSB (for example, due to liquidity or operational problems of the associate members) can have market-wide repercussions (RBI, 2011c). The risks are exacerbated as the DSBs themselves are large participants (with proprietary positions) in both the CBLO and securities segments.

Table 6
Settlement Members with RBI/DSBs

	No. of members	No. of Direct members	No. of Associate Members				
			DSB1	DSB2	DSB3	DSB4	DSB5
G-Sec	163	131	21	6	2	2	1
CBLO	200	112	61	17	5	3	2

Source: RBI FSR Report, December 2011.

4.3 Bivariate Correlation Analysis

A simple bivariate correlation analysis also shows the strong correlation between the financial market indicators and the RTGS system for the annual period of 2005-06 to 2012-13. The correlation coefficients are very high and significant (Table 7). Since the stock market cash leg is settled in commercial bank money and not in RTGS system, we have not done bivariate correlation analysis with respect to the stock market indicators.

Table 7
Correlation Analysis of RTGS System with Financial Market Indicators
(As Percent of GDP)

RTGS and Financial Development Indicators				
	RTGS	Liqliab	Commbank	Bankcred
RTGS	-			
Liqliab	0.87 (0.00)	-		
Commbank	0.99 (0.00)	0.89 (0.00)	-	
Bankcred	0.99 (0.00)	0.87 (0.00)	0.99 (0.00)	-

Note: Figures in parenthesis are p-value.

4.4 FMI Oversight and Supervisory Framework

As discussed in Section 2.4, the FMI oversight and supervision broadly rests with the RBI and SEBI. The RBI, as the regulator and overseer of the PSS, CCIL and PDO system, has issued policy on supervision and regulation of the FMIs on July 2013. Under this, all the FMIs designated by the RBI should comply with the PFMI as applicable to them. In this regard, it has notified 24 principles of FMI based on the new CPSS and IOSCO standards of PFMIs. The SEBI has also issued circular implementing the PFMI to its regulated FMIs.

The co-ordination and cooperation between the RBI and SEBI on various matters take place in various forums, including the Financial Stability and Development Council (FSDC) and its sub-Committee. However, there is no formalised meeting or cooperation between the RBI and SEBI exclusively on payment and securities clearing and settlement systems.

As discussed earlier, both the RBI and SEBI are members of the CPSS and IOSCO, respectively, and are playing pro-active role shaping and implementing the new CPSS-IOSCO standards of PFMIs in their regulatory functions of oversight, supervision and governance of the key FMIs under their purview.

The FSAP of the payment systems in India was carried out by an IMF-World Bank team in September 2011 (IMF, 2013). The FSAP team assessed the PDO against the CPSS-IOSCO - 'Recommendations for Securities Settlement Systems (RSSS)' and concluded that the systems observe or broadly observe the standards, with two standards not being applicable. The FSAP team also assessed the CCIL, the CCP, authorised under the PSS Act, 2007 against the CPSS-IOSCO 'Recommendations for Central Counterparties (RCCP)' and concluded that the CCIL observes or broadly observes the standards, with two standards not being applicable. The assessment of the NSDL and CDSL against the RSSS concludes that the CSDs observes or broadly observes the standards, with three standards not being applicable.

4.4.1 Observations for the Future

As discussed above, the FMIs in India are functioning well and are benchmarked to international standards. However, there are scopes for further improvements. In this regard, some suggestions are given for enhancing the FMIs in India.

4.4.1.1 Inclusion of Commodities Derivative Markets

At present, there are no FMIs in the commodities market. Given the growth and volumes of the commodity derivatives markets in recent year as well as the some commonality of market players such as brokers with the securities market, any disturbance in the commodity derivative market may endanger the financial stability risks in the economy. In this regard, the commodities market regulator, Forward Markets Commission (FMC)'s regulatory powers should be enhanced to regulate the critical FMIs in the commodities markets. Further, in the future, necessary steps should be taken to implement the PFMIs in the FMIs as recognised by FMC.

4.4.1.2 FIMMDA as a Trade Depository

The Fixed Income Money Market and Derivatives Association of India (FIMMDA) is a voluntary market body for the bond, money and derivatives markets and aids in their development. At present, all the corporate bond trades are reported in the reporting platform of the BSE, NSE and FIMMDA. Further, the FIMMDA aggregates the trades reported on its platform as well as those reported on the BSE and NSE with the appropriate value addition and consolidated reports on corporate bond data. Recently, the RBI has also issued circular on August 26, 2013 to all the entities regulated by it to report their secondary market OTC trades in securitised debt instruments within 15 minutes of the trade on the FIMMDA's reporting platform with effect from September 02, 2013. In the future, compliance of reporting to the FIMMDA should be enhanced and should be made as the Trade Depository for corporate bond and secondary market OTC trades in securitised debt instruments.

4.4.1.3 CCIL and Liquidity Risk

The CCIL by acting as a CCP for the CBLO, Government and forex segment of the Indian financial markets, has significantly minimised the risks in these markets. However, due to the CCP function, the CCIL itself has become a source of concentration of counterparty and operation risk to the Indian PSS infrastructure (RBI, 2011b). In order to reduce these risks, the CCIL has put in place a comprehensive risk measures. However, the CCIL can have liquidity pressures if there are adverse conditions. Globally, one of the issues debated is that of the central banks' support to the CCPs as the lender of last resort. Even though, the current legal framework in India does not enable the RBI to extend liquidity support to the CCPs, but the RBI and CCIL are working towards putting in place an alternative backstop arrangement for extending liquidity support to

the CCPs within the existing regulatory framework (RBI, 2012 and IMF, 2013). In this regard, the RBI has granted the status of qualified central counterparty status to the CCIL on January 1, 2014[12].

5. Conclusion and Recommendations

FMIs in India played a significant role in the smooth and efficient functioning of financial markets. Both the regulators have taken steps to enhance the safety and efficiency in their respective FMIs and to limit the systemic risk and foster transparency and financial stability. The IMF and World Bank assessment of the Indian FMIs against the CPSS-IOSCO recommendations for securities settlement systems and central counterparties has shown that the Indian FMIs broadly observe the international standards. Some of the recommendations for further improvements are:

- At present, the RTGS data are based on customer transactions and inter-bank transactions. However, the data flow to the RTGS/PSS from different markets such as money, forex and stock market are not clearly captured yet. Only the CCIL-operated markets are clearly categorised in the RTGS flows. Efforts should be taken to map out the cash settlements of securities markets taking place in the RTGS or PSS, so that the flows from the market segments to the RTGS/PSS can be used for identifying systemic risks.

- The reporting of corporate bond and debt derivatives by the financial institutions should be strengthened and the FIMMDA should be made a trading depository for the corporate bond markets.

- Given the growing volume and values, the commodity markets should be brought under the PFMIs and, accordingly, the FMC's regulatory power should be strengthened for recognising the FMIs in commodity markets and to enforce the PFMIs on such FMIs.

––––––––––––––––

12. http://www.rbi.org.in/Scripts/BS_PressReleaseDisplay.aspx?prid=30317

References

Bank for International Settlements, (2012a), Principles for Financial Market Infrastructure: Disclosure Framework and Assessment Methodology, Available at: http://www.bis.org/publ/cpss106.pdf

Bank for International Settlements, (2012b), Principles of Financial Market Infrastructure, Available at: http://www.bis.org/publ/cpss101a.pdf

Bank for International Settlements, (2011), "Payment, Clearing and Settlement Systems in India," CPSS Redbook, Available at: http://www.bis.org/publ/cpss97_in.pdf

Bank for International Settlement, (2008), The Interdependencies of Payment and Settlement Systems, Available at: http://www.bis.org/publ/cpss84.pdf

Bank for International Settlement, (2003), A Glossary of Terms Used in Payments and Settlement Systems, Available at: http://www.bis.org/publ/cpss00b.pdf

International Monetary Fund, (2013), India: Financial Sector Assessment Program – Detailed Assessments Report on CPSS-IOSCO Recommendations for Securities Settlement Systems and Central Counterparties.

Jalan, B., (1999), "International Financial Architecture: Developing Countries Perspective," 49th Anniversary Lecture, Central Bank of Sri Lanka, Colombo, August 25.

Khan, H.R., (2013a), "Principles of Financial Market Infrastructures & Innovations in Retail Payment Systems: Some Perspectives," Inaugural Address at the International Seminar Organised by RBI in New Delhi, February.

Khan, H.R., (2013b), "Indian Financial Markets: Fuelling the Growth of the Indian Economy," Address Delivered at the Conference Organised by the Confederation of Indian Industry at the ADB Annual Conference in Noida, Delhi NCR, May.

Mohan, R., (2006), "Monetary Policy and Exchange Rate Frameworks: The Indian Experience," Address Delivered at the Second High Level Seminar on Asian Financial Integration Organised by the International Monetary Fund and Monetary Authority of Singapore in Singapore, May 25.

Mohanty, D., (2009), "The Global Financial Crisis: Genesis, Impact and Lessons," Speech at the International Conference on Frontiers of Interface between Statistics and Science, Hyderabad, December 3.

Padmanabhan, (2013), "Principles of Financial Market Infrastructures and Innovations in Retail Payments," Valedictory Address Delivered at New Delhi, February 15.

Chakrabarty, K.C., (2012), "Crisis Preparedness in Interconnected Markets - Prevention is Better than Cure," Keynote Address at the Programme on Crisis Preparedness in Interconnected Markets Held Jointly by CAFRAL and the Toronto Centre, Canada, January 16, 2012 at Hyderabad.

Rajaram, S.; P. Ghose, and S. Sahu, (2012), "Microstructure of Indian Forex Market," Rakshitra, *CCIL*, January.

Reserve Bank of India, (2013), Regulation and Supervision of Financial Market Infrastructures Regulated by Reserve Bank of India, Mumbai, July.

Reserve Bank of India, (2012), Payment Systems in India: Vision 2012-15, Reserve Bank of India Publications, Mumbai.

Reserve Bank of India, (2011a), Financial Stability Report**,** Reserve Bank of India Publications, Mumbai, June.

Reserve Bank of India, (2011b), Annual Report**,** Reserve Bank of India Publications, Mumbai, August.

Reserve Bank of India, (2011c), Financial Stability Report**,** Reserve Bank of India Publications, Mumbai, December.

Reserve Bank of India, (2007), Report on Currency and Finance 2005-06**,** Reserve Bank of India Publications, Mumbai.

Appendix

Table 1
Stylised Statistics of India

SN	Economy ($ mill.)	Pop (mil.)	Area (sq. km)	GT	KA	EI	FD	PST	PS (RTGS)
1.		1210	3287240	C	B	44%	52.3%	1330%	1020%
Note: 1. "Economy (in US $ dollars)" in 2012; 2. "Population (in millions)" in Census 2011; 3. "Area (square kilometers)"; 4. "GT" is Geographical type A. Island, B. Landlocked C. Neither A or B; 5. "KA" is Capital Account A. Not liberalized B. Partially liberalised C. Fully liberalised; 6. External Integration ("EI") indicator is (X of goods and services + M of goods and services)/GDP; in 2012; 7. Financial Development ("FD") indicator is the ratio of total credit of commercial banks and other deposit-taking banks to the private sector by nominal GDP in 2012; 8. Payment System Total ("PST") Transaction Indicator is total transactions in the economy by GDP in 2012; 9. The identified transaction of the Payment System ("PS"), which is total transactions in the economy by GDP in 2012									

Chapter 3

ANALYTICAL FRAMEWORK IN ASSESSING SYSTEMIC FINANCIAL MARKET INFRASTRUCTURES IN INDONESIA

By
Irwanto[12]

1. Introduction

1.1 General Motivation of the Study

Indonesia is an archipelago with more than 17,508 islands located in Southeast Asia and Oceania, and spreads from west to east straddling between the Indian and the Pacific Ocean. Indonesia has 247 million people (2012) spread over 34 provinces. It is the fourth country[3] with the biggest population. The following countries have a common border with Indonesia: Singapore, Malaysia, Philippine, Papua New Guinea, East Timor, Australia, and India (Andaman and Nicobar Island). Indonesia's economy is ranked number 16 in the world with the GDP placed on number 15. Table 1.1 shows the statistics of the Indonesian economy in 2012.

Table 1.1
Statistics of Indonesia Economy in 2012

	Economy (mill. $)	Pop (mil.)	Area (sq. km)	GT	KA	EI	FD	PST	PS
	878,193	247	1,904,569 km^2	A	B	50%	69%	1168%	1156%

Note: 1. "Economy (in US $ dollars)" in 2012; 2. "Population (in millions)" in 2012; 3. "Area (square kilometers)"; 4. "GT" is Geographical type A. Island, B. Landlocked C. Neither A or B; 5. "KA" is Capital Account A. Not liberalized B. Partially liberalized C. Fully liberalized; 6. External Integration ("EI") indicator is (X of goods and services + M of goods and services)/GDP; in 2012; 7. Financial Development ("FD") indicator is the ratio of total credit of commercial banks and other deposit-taking banks to the private sector by nominal GDP in 2012; 8. Payment System Total ("PST") Transaction Indicator is total transactions in the economy by GDP in 2012; 9. The identified transaction of the Payment System ("PS"), which is total transactions in the economy by GDP in 2012

During the last decade (2002-2012), the average of Indonesia's economic growth is at the level of 5.6%. In 2012, although the global economy grew slowly, Indonesia's economy grew by 6.2% and inflation was at 4.3%, a significant decrease when compared to 2006, which was at the level 6.6%.[4] Throughout 2012, the rupiah exchange rate was under depreciation pressure related to the dynamics of the global economy and had an impact on the performance of domestic economy. The rupiah exchange rate weakened on the average of 6.3% or Rp 9.638 per US$ at the end-2012, compared with Rp 9.068 per U.S. dollar a year earlier. When the global crisis erupted in 2008, the rupiah exchange rate was on average at the level Rp11.120 per U.S. dollar. Table 1.2 below shows some key economic indicators for the past 5 years.

Table 1.2[5]
Key Economic Indicators

No.	Indicators	2008	2009	2010	2011	2012
1.	GDP Growth Rate	6.0	4.6	6.2	6.5	6.2
2.	Inflation Rate	11.1	2.8	7.0	3.8	4.3
3.	Exchange rate (Rp/US$)	11.120	9.404	8.996	9.068	9.638
4.	Jakarta Composite Index (IHSG)	1.355	2.534	3.704	3.822	4.317

Indonesia's economic growth is supported by its strong domestic demand characterised by growing investment and consumption. The growing investment is supported by the maintenance of economic stability, investment climate, better investment rate, growing potential market, and its low interest rate. Indonesia's financial system consists of three main pillars: the banking system, non-banking financial institution, and financial authority. The banking system consists of Bank Indonesia (BI) as the central bank, commercial banks, and rural banks. The non-banking financial institutions consist of the insurance companies, multi finance, securities companies and other financial institutions.

Based on the Indonesian Banking Act[6], there are two types of banks in Indonesia, namely, commercial banks and rural banks, both of them can operate in the form of either conventional or syariah principles. By the end of December 2012, there are 120 commercial banks (16,625 branches) and 1,653 rural banks (4,425 branches) in Indonesia. In terms of total assets, the commercial banks still dominate Indonesia's banking industry at 95.97% share, compared with the Islamic banking institutions at 4.03% share. Table 1.3 below shows in more detail the structure of the banking industry in Indonesia.

4. Source: Bank Indonesia, Laporan Perekonomian Indonesia, 2012, available at www.bi.go.id

5. Source: Bank Indonesia, available at www.bi.go.id.

6. Act of Republik Indonesia No. 7 of 1992, concerning banking as amended by Act No. 10 of 1998, Available at: www.bi.go.id/web/en/tentang+BI/Undang-undang+BI

No	Type of Banks	Number	Number of Branch	Total Asset (billion IDR)	% share
1.	Commercial Banks	120	16.625	4,262,587	98.44
	a. Non-Islamic Banks	109	14,480	4,067,569	93.94
	b. Islamic Banks	11	1,745	195,018	4.50
2	Rural bank	1.653	4.425	67.397	1.56
	a. Non-Islamic Banks	1.495	4.024	62.699	1.45
	b. Islamic Banks	158	401	4.698	0.11
	Total	1.773	21.050	4.329.984	100.00

According to the Act of Otoritas Jasa Keuangan (OJK/FSA), starting from 31 December 2013, the institution that regulates and oversees the banking sector and other financial institutions is the OJK/FSA while the Indonesia Capital Market and Non-bank Financial Institution Supervisory Agency (Badan Pengawas Pasar Modal dan Lembaga Keuangan [BAPEPAM- LK]) regulates and oversees the non-banking financial institutions.

According to the Law No.24 of 1999[8] concerning Foreign Exchange and the Exchange Rate System, Indonesia adopts a free foreign exchange regime. Each resident can freely own and use foreign exchange. The exchange rate policy established by BI is based on the exchange rate system established by the Government of the Republic of Indonesia. Indonesia is one of the countries in the world that implemented trade liberalisation. The implementation of trade liberalisation had proven to have a positive impact on the performance of the economy.

The global crisis that occurred in the second half of 2008[9] did not affect the organisation of the payment system made by BI, both, the Real-time Gross Settlement (RTGS) system and the Scriptless Securities Settlement System (SSSS) as well as the system of the Bank Indonesia National Clearing System (SKNBI). By implementing a policy of "no money, no game" and the mechanism completion transactions by the system in case of gridlock in the RTGS system, all critical financial transactions were successfully completed without causing systemic risks. Learning from these conditions, the requirements of prefund still leave potential default risks particularly for clearing debits.

---

7. Source: Bank Indonesia, (2012), Indonesian Banking Statistics, December, Table 1, Available at: http://www.bi.go.id/web/en/Statistik/Statistik+Perbankan/Statistik+Perbankan+Indonesia/

8. Act of Republik Indonesia No. 24 of 1992 concerning Foreign Exchange and Exchange Rate System, Available at: www.bi.go.id/web/en/tentang+BI/Undang-undang+BI

9. Source: Bank Indonesia, Annual Report, 2008, Available at: www.bi.go.id

This study purposes to:

1. Identify the relationships and analyse the level of interconnectedness and interdependency among the systemically important financial market infrastructures (FMIs) in Indonesia;

2. Develop an analytical framework to assess the contagion effect and possible systemic risks arising within the country and outside;

3. Make recommendations related to mitigating such systemic risks; and

4. Share at regional level the assessment of cross-border systemic risks of FMIs.

1.2 General Outline of Paper

This paper is divided into five parts. The background and objective of this paper is presented in Section 1. Section 2 discusses the situation of the FMIs in Indonesia. Section 3 discusses and analyses the statistic money transfer via FMIs in Indonesia, while Section 4 deals with the analysis of the data. The conclusion and recommendation of this paper are presented in Section 5.

2. Overview of FMIs in Indonesia

2.1 General Policy and Regulation Framework towards FMI in Indonesia

There are several laws, regulations and circular letters that are related and relevant to the operations of FMIs and constitute a legal basis for the payment and securities settlement system in Indonesia. The details of some of the laws and regulations are provided in Appendix 1.

2.1.1 Bank Indonesia Act

The Bank Indonesia (BI) Act No.23 of 1999[10] gives the BI the powers to regulate and safeguard the smooth functioning of the payment system. The

---

10. Act of Republik Indonesia No. 23 of 1999 concerning BI, and amended by Act No. 6 of 2009, Available at: www.bi.go.id/web/en/tentang+BI/Undang-undang+BI

Elucidation relating to this Act substantiates this by stating that the BI has to ensure an efficient, speedy, safe and robust or capable payment system. The elucidation is part of law; it can safely be assumed that the BI has a clear mandate to achieve the public key objectives of a safe and efficient payment system. Article 15 of the Act also explicitly authorises the BI to: (a) operate and grant approval and license the arrangement of the payment system service; (b) require the operator of the payment system service to submit reports on their activities; and (c) determine the use of payment instruments. With these powers, the BI plays a strategic role as operator, regulator, licensor and overseer of payment systems in Indonesia. In addition, the BI Act provides a legal basis for BI to conduct these following activities:

1. Regulate and operate the clearing system for interbank payments;

2. Approve the operation of clearing systems for interbank fund transfers that is conducted by parties other than BI;

3. Conduct settlement services for interbank payments; and/or

4. Approve the operation of settlement services for interbank payments that is conducted by parties other than BI.

2.1.2 Payment System Regulation Issued by BI

BI has the power to issue regulations to enforce its authority over the payment systems. There are two forms of regulation issued by BI, namely, the Bank Indonesia Regulation (*Peraturan Bank Indonesia* [PBI]) and the Bank Indonesia Circular Letter (*Surat Edaran Bank Indonesia* [SEBI]). These regulations are incorporated in the State Gazette and, thus, are publicly binding. At present there are various aspects of payment systems that are already covered by these regulations, ranging from regulations on the system of making transfers, i.e., BI-RTGS, BI-SSSS and SKNBI, on payment instruments, i.e., Card-based Payment Instruments and Electronic Money, and on other transfer mechanism, i.e., Money Remittance.

2.1.3 *Other Regulations Related to Payment System in Indonesia*

Further, there are several additional acts related to the payment system that must be followed:

- **The Act No.7 of 1992 on Banking[11]**, as amended by Act No. 10 of 1998, (hereinafter referred to as the Banking Act), sets out the general stipulations on banking activities. Under the Act, there are two types of banks, commercial banks and rural banks. Article 6(e) of the Act stipulates that one of the activities of commercial banks is to conduct transfers, whether on their own behalf or on behalf of their customers. On the other hand, for rural banks, there are some limitations regarding their participation in the payment systems.

- **The Act No. 37 of 2004 on Bankruptcy and Suspension of Obligation for Payment of Debts** is an important Act with regard to the payment system as it provides the legal basis for the exclusion of zero hour rules for payment transactions. This Act touches on the issue of finality of settlement in the case of bankruptcy or liquidation by stipulating in Article 24 Paragraph (3) that, in the case of the transfer of funds, where the transfer has been made before the pronouncement of bankruptcy, the transfer shall be deemed to be completed.

- **The Act No. 24 of 2004 on Deposit Insurance Agency** and its elucidation state that the customers' funds which are going to be transferred out of the bank, but are still under such bank's bookkeeping, shall be deemed as customers' deposits. And, likewise, incoming transfers for customers which have already been received by the bank, but are yet to be credited to the respective customers' accounts, shall also be deemed as customers' deposits.

- **The Act No. 11 of 2008 on Electronic Transaction and Information** has a significant impact on payment systems in Indonesia as it serves as the legal basis for the validity of electronic signature and for the acceptance of electronic information/documents as a lawful means of evidence before a court of law. These are influential for payment activities in Indonesia as most of the payment activities nowadays are conducted with the support of advanced technology. Furthermore, this Act provides assurance to the industry to take advantage of the latest technology in developing new payment mechanisms.

---

11. Op. cit., see No. 6.

- **The Act No. 8 of 1995 on Capital Market (Capital Market Act)** is the main piece of legislation that regulates the operations of securities exchange, clearing and guarantee for settlement of on-the-exchange traded securities, as well as central securities depository. Under the Capital Market Act, the clearing, guarantee, settlement, and depository services are conducted by the Indonesia Clearing and Guarantee Corporation (PT. Kliring Penjaminan Efek Indonesia [PT. KPEI]) and Indonesia Central Securities Depository (Kustodian Sentral Efek Indonesia [PT. KSEI]). These institutions obtained their licences from the BAPEPAM-LK prior to conducting their services. At present, BAPEPAM-LK had only licensed PT. Kustodian Sentral Efek Indonesia (PT. KSEI) as Indonesia's central securities depository (CSD), and PT. KPEI as the only central counterparty (CCP). Since December 31, 2012, based on Act No. 21 of 2011[12], the BAPEPAM-LK's function to regulate and supervise the capital market has been transferred to the OJK/ FSA.

- **Government Securities Acts**: Act No. 24 of 2002 on Government Securities and Act No. 19 of 2008 on Government Sharia Securities provide the mandate to BI as the auction agent and registrar of government securities. These legislations provide the legal framework for BI to regulate and operate the BI-SSSS. The BI-SSSS is an electronic securities settlement, depository and bidding system that enables its members to electronically transfer its securities to the other members and conduct securities transactions with BI. The functions of the BI-SSSS include the administration of various types of securities transactions, as well as registration, depository, and transfer of title/holder of securities held at BI-SSSS. The securities that are registered, deposited and settled in BI-SSSS are only BI certificate/the central bank bills (Sertifikat Bank Indonesia [SBI]) and the government securities (Surat Berharga Negara [SBN]) that consists of the conventional securities (Surat Utang Negara [SUN]) and sharia securities (Surat Berharga Syariah Negara [SBSN]).

2.1.4 Bye Laws

To complement the regulations issued by BI and by the other relevant authorities, the interbank payments activities in Indonesia are also regulated by the rules formulated by the relevant industries or participants themselves. These

_____

12. Act of Republik Indonesia No. 21 of 2011 concerning Otoritas Jasa Keuangan, Available at: www.setneg.go.id/index.php?option=com-perundangan

rules are generally issued in the form of bye-laws or other similar "club rules", and basically cover more detail and specific aspects of the particular payment activities. Usually they pertain to areas which are not covered by authorities' regulations and are mostly related to the common procedures of certain parts of day-to-day activities.

2.2 Stylised Facts of FMIs in Indonesia

There are two payment and settlement systems (PSSs) in Indonesia: interbank large-value payment system and retail and micro-payment system (see Appendix 2). For large-value and time-critical interbank payments, the settlement can divided two categories. The first category is operated by the central bank: BI-RTGS (Payment System), SKNBI (Retail PS) and BI-SSSS (Securities Settlement System [SSS] and CSD). The second category is operated by private companies, such as KSEI (CSD) and KPEI (CCP). Currently, BI is developing a new BI-RTGS, including a Trade Repository (TR) named the Electronic Trading Platform. Meanwhile, KSEI[13] also functions as a Trade Repository for over the counter (OTC) transactions. In the retail and micro-payment system, most of the retail and micro-payment services are provided by the commercial banks through some payment instruments: cheque and bilyet giro, electronic payment instruments, and banker acceptance (bank draft). Interbank payments with cheques and bilyet giros are processed through SKNBI. SKNBI is a deferred multilateral net settlement system, in which settlement of the net figures from SKNBI is conducted at the designated time on the same day through the BI-RTGS system. For card-based payment instruments (credit and debit/ATM cards), settlement for the interbank level is also conducted on multilateral net basis using the central bank money (through BI-RTGS system) or commercial bank money (through the accounts at commercial banks appointed as the settlement banks). Description for every FMI is given in Appendix 3.

2.2.1   BI-RTGS

The BI-RTGS is a RTGS operated by BI that processes fund transfers between the accounts that financial institutions (or participants) hold with BI. It is used to settle a wide range of payments including interbank money market transactions, large-value retail credit transfers, the cash legs of Government Bond and other securities transactions, the net positions arising from retail payment systems, and transactions related to BI money market operations. The BI-RTGS is central to the payment system in Indonesia. Domestically, the BI-

---

13. Profile business of KSEI, Available at: www.ksei.co.id

RTGS is connected to some payment systems, for examples, BI-SSSS (CSD), SKNBI (CCP), KSEI (Delivery versus Payment [DvP]), payment bank and settlement bank. In a cross-border context, the BI-RTGS is connected with CHAT Hong Kong for Payment versus Payment (PvP) transactions (US$/Rp). In 2013, the amount of fund transfers through the BI-RTGS averaged 1,445,043 transactions monthly worth a value of US$729 billion.

2.2.2 BI-SSSS

The BI-SSSS is a SSS and CSD for Government Bond Book-Entry System and Monetary Instrument of Bank Indonesia. Money Settlements for BI-SSSS Services are conducted in central bank money by debiting and crediting the participants' current accounts at BI. BI-SSSS transactions are conducted DvP through the interface with the BI-RTGS.

2.2.3 SKNBI

The SKNBI is the interbank clearing system for domestic retail credit transfer, bilyet giro and cheques. The SKNBI acts as a central counterparty. The SKNBI system is located across Indonesia with the major ones operated by Head Office of BI, Jakarta. The net position arising from the SKNBI system is settled through the BI-RTGS at a designated time.

2.2.4 KSEI

KSEI[14] is a CSD that is operated by a private company for Stock, Corporate Bond, Right and Warrants, Medium-term Notes, Negotiable Certificate Deposits, Promisory Notes, Commercial Paper, Government Bond, BI Certificate, Sukuk, Reksadana, and others. KSEI directly participates in the BI-RTGS, and uses its current account at BI to conduct net settlement with its participants. As of May 2006, as the Sub-registry of BI, KSEI has included Government Bonds (SUN) depository and transaction settlement services. In the same year on August, KSEI started to provide the administration of Government Retail Bonds (ORI). In its development, another improvement has been made by KSEI since March 2007 by facilitating BI Certificate (SBI) depository and transaction settlement. This is possible since Central Depository and Book Entry Settlement System (C-BEST) has been integrated with BI-SSSS owned by BI, enabling an ideal single communication platform for SUN and SBI trading by KSEI's service

---

14. Op. cit., No. 14.

users. Money settlements and payments of cash collateral to the KPEI are conducted in central bank money at the BI.

2.2.5 KPEI

KPEI[15] is a CCP that operated by a private company, which also has a role in shaping the direction of Indonesian capital market development. As a CCP, KPEI provides clearing and guarantee services of stock exchange transactions settlement. KPEI functions to improve efficiency and certainty of transactions settlement in Indonesia Stock Exchange (IDX). KPEI performs clearing process to determine the Clearing Members' (CMs) rights and obligations in terms of securities and/or cash which must be settled on the settlement date. As a CCP, KPEI is the only seller for every buyer and the only buyer for every seller for every transaction settlement over every investment instrument that is traded in the stock exchange. This is possible by means of netting clearing process through novation.

2.2.6 KSEI Payment Bank[16]

To provide securities transaction settlement services by book-entry, KSEI has appointed five Payment Banks for the period of 2011-2015, namely, (1) PT Bank Central Asia Tbk; (2) PT Bank Mandiri (Persero) Tbk; (3) PT Bank CIMB Niaga Tbk; (4) PT Bank Negara Indonesia (Persero) Tbk; and (5) Bank Permata Tbk. The cooperation between KSEI and the Payment Banks is carried out considering that KSEI, as a non-banking institution, cannot perform fund book-entry function, especially fund payment to service users. Also, it is related to the requirements of fund position placement in a specific account in bank, pursuant to BAPEPAM-LK Regulation No. III.C.6 regarding the Operation Procedures and Internal Control of Depository and Settlement Institution. The whole fund recorded in Securities Account owned by the Account Holder will be placed in Payment Bank in a specific account by KSEI.

2.2.7 BI-RTGS-US$ CHAT (PvP Link)

In cross-border context, BI has only one payment-versus-payment (PvP) link mechanism with US$ CHAT Hongkong and has been established since 2010.

---

15. Summary of profile of KPEI, Available at: www.kpei.co.id

16. Op.cit., No.14.

The PvP transaction mechanism is conducted by US$ CHATS and BI-RTGS at same time (simultaneously) to settle US$ against the rupiah. The settlement institution (SI) of the US$ CHATS is the Hongkong and Shanghai Banking Corporation Limited (HSBC), and the system operator (SO) of the system is the Hong Kong Interbank Clearing Limited (HKICL). The system operates from 08:30 to 18:30 Hong Kong time (GMT+8) on all days, except Saturdays, Sundays and 1 January. Figure 2.1 below shows US$/IDR PvP Link Services.

Figure 2.1
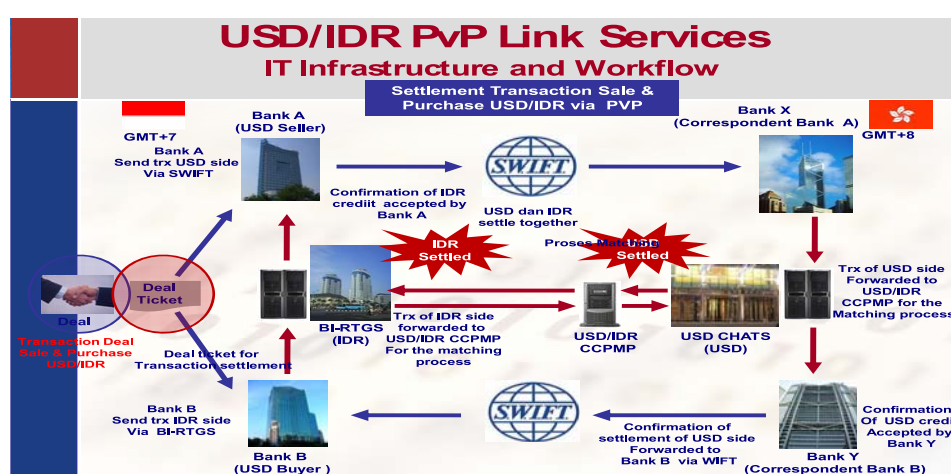
2.3 Mapping of Interdependencies of FMIs in Indonesia

The RTGS system, which is the large-value payment system in Indonesia, is the most systemically important payment system in terms of the value of transactions settled. At present the BI-RTGS averaged daily transactions around 96% of total value of the interbank payments in the country. The settlement of money through the RTGS relates to transactions from all the markets, i.e., Interbank Money Market, Bond Market, Securities Market and Foreign Exchange. The FMIs involved in the settlement of money as well as the securities settlement process are identified in Table 2.1 below.

For the purpose of facilitating the clearing and settlement of financial transactions, there are two payment systems in Indonesia, namely, the Retail Payment System (RPS) and the Large-value Payment System (LVPS). Based on the market, the FMIs system can be categorised into five markets: the retail market, money market, foreign exchange market, capital market and bond market.

The connections of the FMIs are direct and indirect. Of all the FMI systems, the BI-RTGS is in the centre of all the payment systems in Indonesia. Figure 2.2 below depicts the inter-linkages among the FMI systems in Indonesia.

Vertically, the BI-RTGS system has a direct cross-system relationship with some systems such as the BI-SSSS System (CSD), KSEI System (CSD), Payment and Settlement Bank and US$ CHATS. Meanwhile, KSEI as CSD has the C-BEST System that is directly connected with the BI-RTGS, BI-SSSS, and KPEI as CCP, brokers, fund managers, custodian bank, issuers, payment banks and has an indirect relationship with the trading system in Indonesia Stock Exchange (IDX). KPEI as CCP has a direct relationship with the IDX system and KSEI and functioned as FMI for the clearing and settlement transaction trading of IDX. See Figure 2.2.

Horizontally, the BI-RTGS system as payment system is directly connected with SKNBI. Meanwhile, the BI-SSSS is directly connected with KSEI System (C-BEST). Securities settlement is conducted by BI-SSSS and/or C-BEST (KSEI) and settlement of funds is conducted by the BI-RTGS. See Figure 2.2.

Table 2.1
Mapping the Interdependency of FMIs[17]

SN	MARKET		CLEARING	SETTLEMENT	
				MONEY	SECURITIES
1	Interbank Money Market[18]	-Call Money -Loan -Repo Transaction	SKNBI	BI-RTGS	BI-SSSS
2	Bond Market	- Government Bond - Corporate Bond	KPEI	BI-RTGS PAYMENT BANK	BI-SSSS C-BEST
3	Securities Market	- Stock - Others Securities	KPEI	PAYMENT BANK	KSEI
4	Foreign Exchange	- Interbank Tx	X	BI-RTGS PVP LINK	X

_____

17. Interdependency of payment and settlement system of FMIs in Indonesia.

18. Special for commercial banks.

Figure 2.2
FMIs in Indonesia

Figure 2.2
FMIs in Indonesia
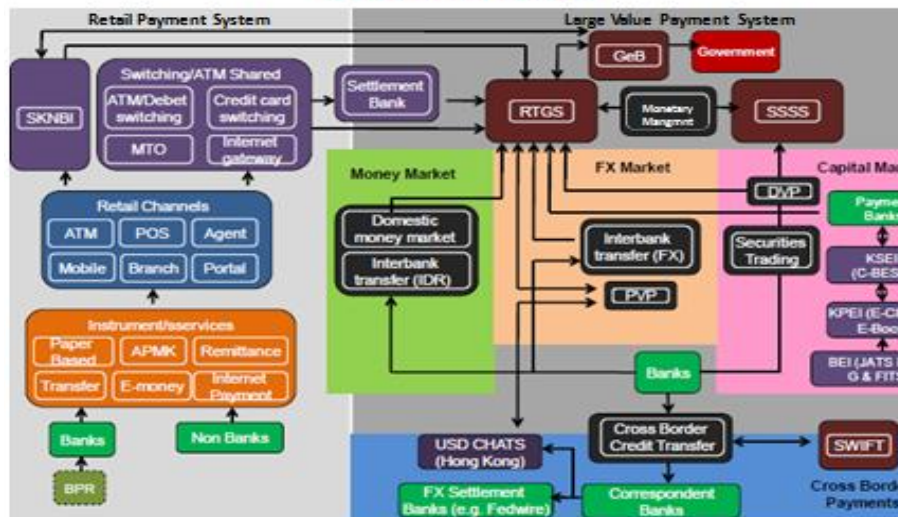
2.4 Oversight and Supervisory Authority of FMIs

Based on legislation, there are two institutions that have authority to oversee and supervise the operators of FMIs in Indonesia: BI and BAPEPAM-LK (presently constituted as Otoritas Jasa Keuangan [OJK]). BI has the authority to oversee and supervise the payment and securities settlement system, such as BI-RTGS (PS), BI-SSSS (SSS) and SKNBI (PS). On the other hand, OJK has the authority to oversee KSEI (CSD and TR) and KPEI (CCP). The main purpose of BI is to oversee the FMIs to safeguard the smooth operation of the payment systems and to achieve financial system stability. BI is also concerned with the safety and efficiency of the payment system and with customer protection in order to maintain public confidence in the interbank payment and settlement system, especially BI-RTGS and BI-SSSS as a Large-value Payment System. On the other hand, the oversight performed by BI is for mitigating systemic risk from interconnectedness of FMIs. The description of the oversight and supervisory authority of FMIs in Indonesia is provided in the Appendix 2.

3. Financial Statistics in Indonesia

FMI is one of the infrastructures highly needed by a country to support the proper implementation of the financial system. The development of the financial market of a country has encouraged its central bank and/or other financial

69

authorities to preserve and maintain the interconnection among systems or, more specifically, among the FMIs, in order that they perform properly without interruption. This section will discuss the strength of the interconnection among the systems, observed from the viewpoint of the financial market statistics reflected in the transactions coursing through the BI-RTGS system, particularly in the four types of primary financial market, namely: the money market, the bond market, the foreign exchange market and the securities market, as well as other transactions settled through the BI-RTGS system. This section consists of three sub-sections: Sub-sections 3.1 - FMI Statistics in Indonesia and Sub-section; 3.2 - Financial-related development indicators; and 3.3 – Cross-border Transactions. The development of the FMI statistics will serve as the basis of analysis in the next section.

3.1 FMI Statistics in Indonesia

As explained in Section 2 above, the BI-RTGS system is a financial system infrastructure which is systemic in nature and vital for the financial system in Indonesia. As the center of the settlement systems in Indonesia, the BI-RTGS system plays a vital role in ensuring the proper implementation of securing financial transactions. Besides the BI-RTGS, the major FMIs in Indonesia, including the BI-SSSS, the CCP (KPEI) and the CSD (KSEI) and Retail Payment System (BI-SKNBI) that are operated by BI, are closely linked to each other centering around the BI-RTGS. The DVP service conducted through the BI-RTGS ensures that a buyer's payment for securities is made at the time of delivery through the BI-SSSS (security delivery and payment are simultaneous). Through the BI-RTGS, participants are also able to settle the rupiah legs of their foreign exchange transactions using the PVP service provided by CHAT Hong Kong. The BI-RTGS, meanwhile, provides net-settlement services through which the net amounts of transactions carried out in the BI-SKNBI are transferred between the current accounts of the participants concerned at the designated times. The BI-RTGS is also used to make final settlements of various financial transactions settled through the FMIs.

In this section, we shall explain the statistics for the final financial settlement that can be observed from the above-mentioned four market groups. First, the money market group, which conducts the settlement of all transactions among the money market banks with a period of 1 – 99 business days and less than 1 business day, by using the Transaction Reference Number (TRN) IFTM00 and IFTM01 lines. Second, the bond market group, which conducts all settlements of the sale and purchase of government securities and BI Certificates (SBI) among the participants, by using the TRN BIRMMM line. Third, the Forex

Market group, namely the settlement of transactions of sale and purchase of rupiah versus foreign exchange, both domestically and cross-border, by using the TRN IFTFX line. Fourthly, the securities market group, namely the settlement of interbank transactions related to securities market transactions by using the IFTSX line.

3.1.1 Total Number of Participants/Volume in the RTGS System

Pursuant to BI Regulation[19], the participants in the implementation of the BI-RTGS System are classified into two groups, namely Direct Link Participants (DLPs) and Indirect Link Participants (ILPs). DLP are the participants which can conduct RTGS system transactions directly, by using the RTGS terminal of the participants. ILP are the participants which can conduct RTGS system transactions indirectly, the implementation of which is conducted by BI officers by using the RTGS terminal of BI. To date, all the participants which have been registered and approved for accessing the BI-RTGS system are DLPs, which consist of BI, Commercial Banks and Non-bank Participants.

Since the implementation of the BI-RTGS system in Indonesia in 2000, the settlement of transactions through the BI-RTGS system has recorded quite significant growth both in terms of volume and value. However, the number of participants in the BI-RTGS system has decreased, specifically from 196 participants in 2008 to 189 at the end of 2012, which consist of 41 participants from Representative Office of BI, 144 commercial bank participants and 4 non-banking participants, namely PT.KSEI (CSD), PT. Artajasa (Switching Company), PT. Finnet (Switching Company) and the Indonesian Export Financing Institution (Lembaga Pembiayaan Ekspor Indonesia [LPEI]). The bank participants consist of two groups, namely the foreign exchange banks and the non-foreign exchange banks. BI participants and foreign exchange bank participants may conduct all transactions from the above-mentioned four market groups. Non-foreign exchange bank participants may only conduct transactions with three market groups, namely: money market, bond market and securities market, while the group of non-bank participants may only conduct transactions in certain TRN stipulated by BI.

For BI-SSSS, according to the records, at the end of 2012, the number of DLPs in the BI-SSSS system was 175 participants, comprising 5 departments of BI, 136 commercial banks, 1 non-banking institution, 3 government agencies, as well as sub-registries and brokers, namely 16 and 14 participants, respectively.

_____

19. BI Regulation No.6/8/PBI/2004 concerning BI RTGS System.

At the same time, there were 112 participants recorded in the IDX, comprising 37 commercial banks, 17 custodian banks and 58 securities companies. The detailed data on the participants of three systems is provided below in Table 3.1.

Table 3.1
Number of Participants in the FMI Indonesia

(End of year)

	2008	2009	2010	2011	2012
BI-RTGS					
Total Number of participants	196	191	191	188	189
Direct participants	196	191	191	188	189
Commercial Banks	151	146	146	143	144
Bank Indonesia 1)	41	41	41	41	41
Other participants 2)	4	4	4	4	4
BI-SSSS					
Total number of participants	174	173	175	174	174
Bank Indonesia 3)	4	5	5	5	5
Commercial Banks	139	135	136	135	135
Non bank	1	1	1	1	1
Government	1	3	3	3	3
Sub Registry	16	15	16	16	16
Broker	13	14	14	14	14
INDONESIA STOCK EXCHANGE					
Total number of participants	112	107	111	112	112
Bank Indonesia	NA	NA	NA	NA	NA
Commercial Banks	34	35	37	37	37
Custodian Bank	16	16	17	17	17
Securities company	62	56	57	58	58
Note :	1) Incl. Representative Office of Bank Indonesia				
	2) Consists of KSEI, Artajasa, Finnet and LPEI				
	3) Incl. some of departement				
	4) NA = Not Applicable				
Sources	1) Bank Indonesia				
	2) Indonesia Stock Exchange				

3.1.2 *Total Volume in the RTGS System (Annual)*

Even though the number of participants in the BI-RTGS system has decreased in the last 10 years, the total volume of transactions has increased significantly, notably from 2.1 million transactions in 2002 to 15.3 million transactions in 2012, an increase of 15.3 million transactions or 719%. This indicates that the BI-RTGS system is increasingly efficient. However, if we observe the volume of transactions in the above-mentioned four markets, the total volume has been fluctuating and it tends to decrease, specifically from 318,571 transactions in 2002 to 290,607 transactions in 2012. This decrease occurred in the four market groups. If we observe the development per market group, particularly the Forex Market during the last 10 years, we can see that the number of transactions reached its peak, attaining 180,267 transactions in 2007, a year prior to the 2008 global financial crisis. If we observe the market share aspect, the volume of

transactions processed by the 5 largest senders was 48.47% (March 27, 2013). The transaction volume statistics for 10 years (2002-2012) are provided below in Chart 3.1.

Chart 3.1
Volumes in BI-RTGS System
Based on Market-type Classification
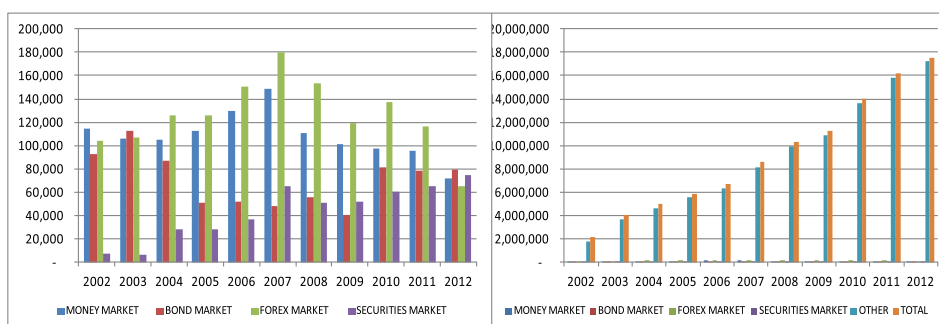
3.1.3 Total Value in the RTGS System (Annual)

During the 11 year period, the value of transactions in the BI-RTGS system has increased significantly (see Appendix 5). The total value of transactions in 2002 was US$ 1,509 billion, while at the end of 2012, it has reached US$ 10,150 billion, an increase of US$ 8,641 billion (573%). The highly significant increase in the value of transactions indicates that the BI-RTGS system is increasingly efficient. Similarly, the total volume has also increased, with most of the significant increase occurring in the others group or customer transactions. (see Chart 3.2). Other market value which increased significantly occurred in the 2009-2012 period. Among the four markets as explained above, the number of transactions in the state securities market and the interbank money market is larger compared to the other two types of markets. This shows the recovery of the Indonesian economy after the global financial crisis. If we observe the market share aspect, the value of transactions conducted by the 10 largest senders through the BI-RTGS system was 20.64% (19 September 2013).

73

Chart 3.2
Market Value Traded in BI-RTGS
System Based on Market-type Classification
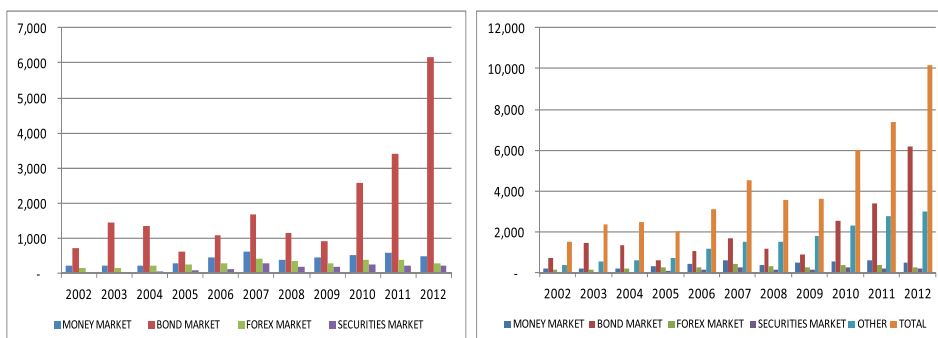
3.1.4 Total Volume in the RTGS System (Monthly)

In the last 3.5 years (January 2010 – June 2013), the total monthly volume of transactions settled through the BI-RTGS from the four market groups has been decreasing. A rather sharp decrease occurred in the forex market. During the period of 2010 up to, and including, August 2011, the average total volume of forex transactions was above 10,000 times per month, while since early September 2011 up to, and including, June 2013, the forex trading activities have decreased significantly, with the lowest volume of transactions occurring in December 2012, at US$ 18.150 million. The decrease in the total volume of forex transaction settlement occurred when the reference interest rate, namely the BI Rate, was 5.75% - 6.00%, and the inflation rate (yoy) was below 5% with the average exchange rate below Rp 9,000 per US$. Overall, the largest total volume of settlement was in the others group. See Chart 3.3 below.

Chart 3.3
Volumes in BI-RTGS Based on Market-type Classification

74
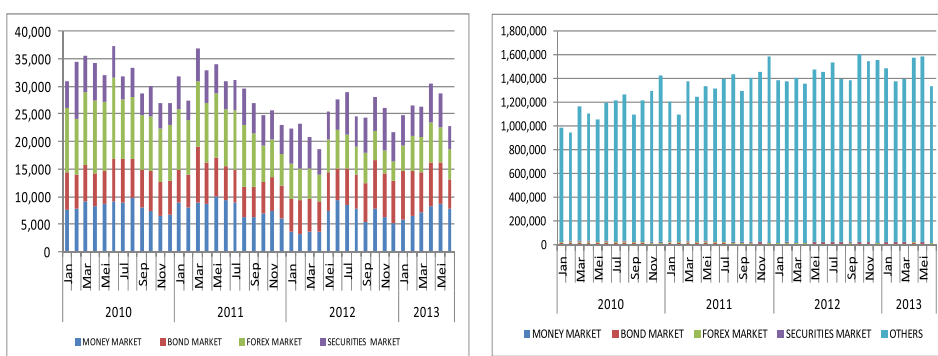
3.1.5 Total Value in the RTGS System (Monthly)

Since January 2010 to May 2013, the three markets (Money Market, Forex Market and Securities Market) were relatively stable, with no fluctuation in the settlement value (see Appendix 6). A quite significant fluctuation occurred in the Bond Market. The trend towards significant increase in the settlement value occurred since June 2011 at US$ 255 billion, until May 2012 at US$ 632 billion, with the peak in settlement value in January 2012 at US$794 billion. The increase occurred particularly as a result of the improving condition of the government securities (SUN) market in Indonesia and the increasing global liquidity due to the implementation of quantitative easing (QE) by the Federal Reserve. This has encouraged global investors to enter into the emerging countries, such as India, Indonesia, etc. BI stated in the Financial Stability Review Report as at September 2012[20] that the SUN market improved steadily during the first semester of the year compared to the preceding semester. The policies instituted by BI and the governmental financial authority successfully dampened shocks on the SUN market that occurred in the previous semester, thereby maintaining market stability. Positive sentiment prevailed amid widespread uncertainty surrounding the resolution of the financial issues in Europe at the end of semester I-2012, which was well responded to by the domestic market, as reflected by a solid SUN market. Furthermore, the stable domestic economy overcame sluggish global markets, which became a form of stimulus and led to a less dramatic slump in government issued bonds in Indonesia compared to other securities. See Chart 3.4 below.

Chart 3.4
Market Values Traded in BI-RTGS
Based on Market-type Classification

---
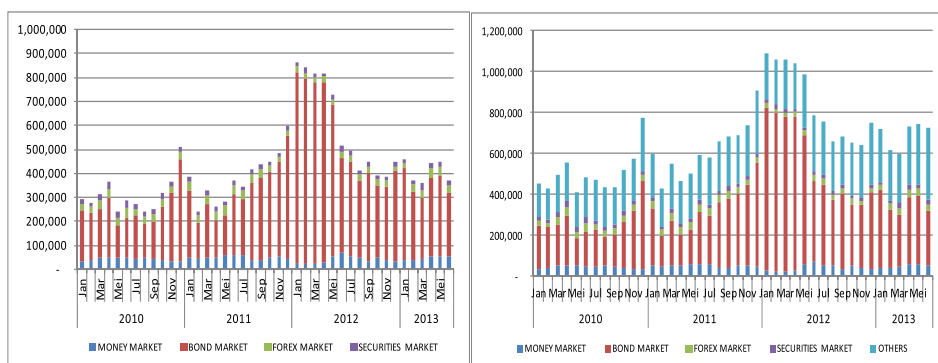
20. Bank Indonesia, Financial Stability Review, September, 2012, pp. 46-48.

3.2 Financial-related Development Indicators

The financial-related development indicators are classified into two groups of indicators, namely financial development indicators and stock market development indicators. Each group consists of three indicators which will be explained in the next section. The financial development indicators are used to observe the intensity of the financial development of a country, while the stock market development indicators can explain the level of development of the securities market of a country. The level of correlation between the existing indicators and the BI-RTGS system will be discussed in the next section.

3.2.1 Financial Development Indicators

The financial development indicators are formed by following indicators:

1. Liqliab is the sum total of currency plus demand and interest bearing the liabilities of commercial banks and non-banks divided by the nominal GDP, which is used to gauge the financial intensity of a country.

2. Commbank is the total asset of commercial banks divided by the sum of commercial bank and non-bank and central bank assets, which is used to gauge the degree that banks allocate their credits.

3. Bankcred is the ratio of total credit of commercial banks and other deposit-taking banks to the private sector by nominal GDP, which is used to gauge the level at which the credit of banks is allocated to private sector.

As shown in the graph below, the liqliab index tends to decrease during 2002-2012 (see Chart 3.5.) while the other two indices are on an upward trend, which lends evidence to show that the financial intensity displays an improvement tendency in Indonesia.

Chart 3.5
Financial Development Indicators (2002 – 2012)
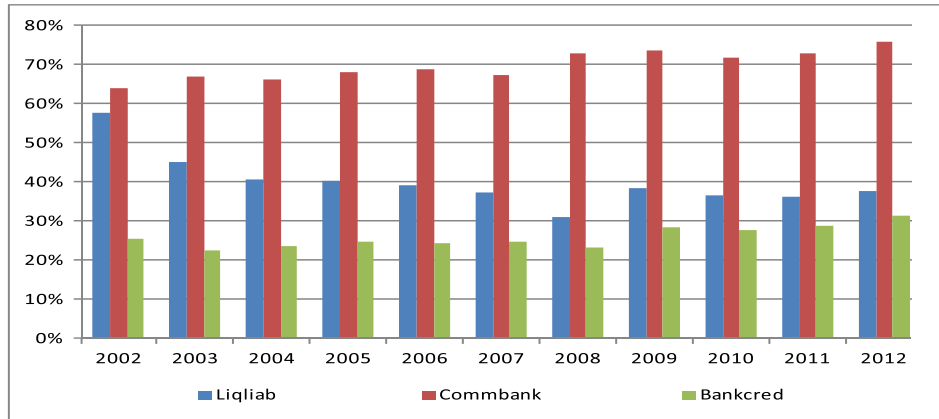
3.2.2 Stock Market Development Indicators

The stock market development indicators are formed by the following indicators:

1. MktCap, namely the total value of stocks in the domestic market divided by GDP, which is used to gauge the scale of stock market.

2. ValTrade, namely the total value of stock being traded by GDP, which is used to gauge the scale of stock market.

3. Turnover, namely the total value of stocks being traded divided by the total value of stocks listed in the domestic market; stock price index, which is used to gauge the level of liquidity in the stock market.

During the period of 2002-2012, the impact of the 2008 crisis can be observed from two indicators, namely the MktCap indicator, which experienced a rather sharp decrease in 2008 to 19%, compared to the previous period which recorded 49% (2007) and, thereafter, it increased to 49% (2009) and declined to 41% (2012). The ValTrade indicator also experienced a rather sharp decrease in 2008 to 19%, compared to the previous period at 26% (2007). After the 2008 crisis, the ValTrade ratio continued to decrease to 16% (2011) and rebounded to 82% in 2012. See Chart 3.6.

Chart 3.6
Average Stock Market Indicators (2002 – 2012)
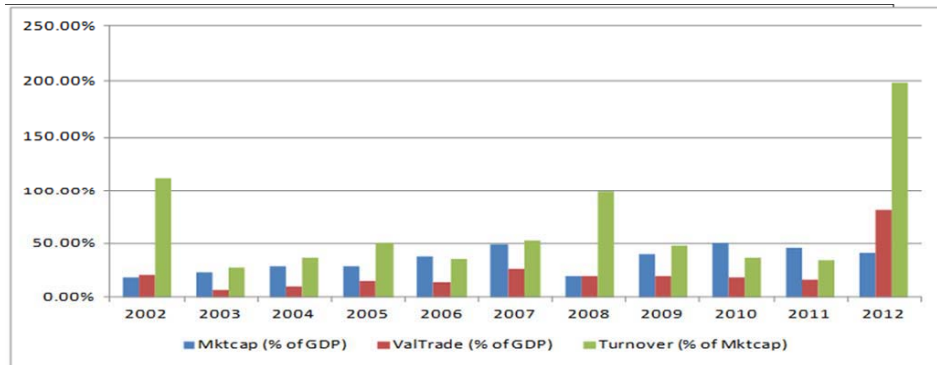
3.2.3 Export Import Development Indicators

The Export Import development indicators are formed by the following indicators:

1. EI Good Only, namely the total value of export import good only divided by GDP, which is used to gauge the scale of export import.

2. EI Good and Services, namely the total value of export import of good and service by GDP, which is used to gauge the scale of total of export import.

Based on the data of BI, during period of 2002-2012, the performance of total exports and import goods and services from/to Indonesia tended to increase from US$100.000 million in 2002 to US$424.930 million in 2012. In 2009, total export goods and services from/to Indonesia declined by 18.47% compared to the previous year. The decline of import and export in 2009 was impacted by the global financial crisis in 2008. See Chart 3.7.

Chart 3.7
Export Import Development Indicators (2002 – 2012)
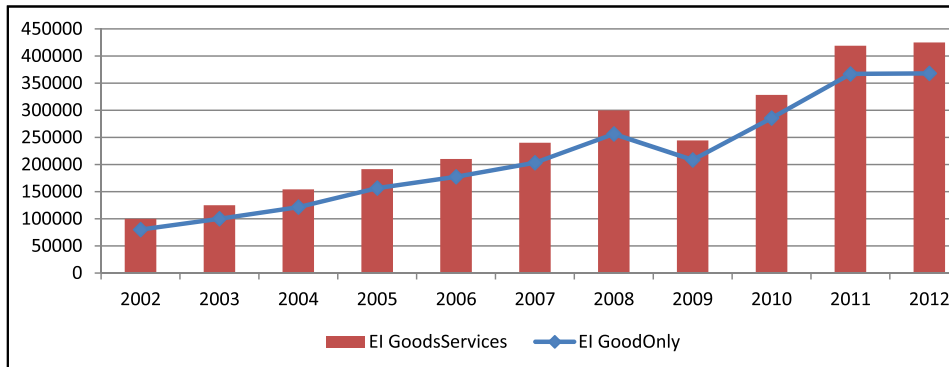
3.3 Cross-border Transaction

In January 2010, BI as the administrator of the large-value payment system, developed the BI-RTGS system, by connecting the BI-RTGS system with the RTGS system in US$, which is referred to as the United States Dollar Clearing House Automated Transfer (US$ CHAT) System, the administration of which is conducted in Hong Kong. The purpose of the connectivity between the BI-RTGS system and US$-CHAT is to provide the facility for rupiah settlement in the BI-RTGS system and US Dollar settlement in the US$-CHAT system of sale and purchase transactions of US$ against the rupiah in Indonesia, which are settled simultaneously, or referred to as the Payment-versus-Payment (PvP) mechanism, with the objective of mitigating the foreign exchange settlement risks. This connectivity is the only method that accommodates cross-border transaction. During the period of 2010–2012, the volume and value transaction of US$/Rp were insignificant compared with the other FMIs transactions.

4. Result and Analysis

4.1 Analysis of 2008 Global Financial Crisis and Country Specific Analysis

Based on the research conducted by Tintchev[21], published as an IMF Working Paper, the global financial crisis started from the interbank turbulence in early August 2007, which is a signal of the crisis, and disasters at Bear Stearns in March 2008 led to the collapse of Lehman Brothers in September 2008, followed

_____

21. Tincthev, Kalin, (2013), "Connected to Whom? International Interbank Borrowing During the Global Crisis," *IMF Working Paper.*

by the disturbance of financial center of the world in America, causing the global financial crisis to spread to many countries, including the emerging economies, Indonesia included. According to Claessen, there are four new dimensions that exacerbate the global financial crisis, namely: (1) the widespread use of complex and opaque financial instruments; (2) the increased interconnectedness among the financial markets, nationally and internationally, with the U.S. at the core; (3) the high degree of leverage of financial institutions; and (4) the central role of the household sector.

The global financial crisis that started in America had led to a liquidity crisis in the world financial markets. It encouraged the global financial markets to pull back U.S. dollar investments in countries whose economies are developing, including Indonesia. Due to the interconnectedness of financial markets, the pull-back by foreign investors caused a sell-off in the currencies of securities of both fixed income (bond market) and stock (securities market) and other financial assets to attract dollars previously invested in Indonesia. The U.S. dollar thus strengthened or the rupiah was weakened.

The influence of large-scale withdrawal of U.S. dollar portfolio of financial markets in Indonesia since October 2008 caused the Jakarta Composite Index to decrease from its highest level in 2008 at 2,830 to its lowest level at 1,256 on March 2, 2009. Meanwhile, the IDR / US$ in 2008 fell to its lowest level at Rp 12.400 per 1 US$ on November 24, 2008. One of the traditional policy responses undertaken by BI involved the central bank raising the benchmark interest rate to 9.50% in November 2008, reaching its highest level in 2008. There were also several other policies conducted by BI, among others, changes in Open Market Operations. The goal of the BI policy is to maintain monetary stability and financial system stability.

Although the global crisis is considered to have slightly affected the settlement value in the money market and capital market, especially in the second half of 2008, the durability of the payment system was maintained. Segmentation problems that occur in the money market also increase the liquidity crunch in the industry, so to the extent it continues to cause potential systemic risk, payment systems also affect the entire banking industry and the financial system, but this should not happen. By applying the principle of "no-money, no-game" and the settlement mechanism in the system in case of gridlock at the BI-RTGS system, all the critical financial transactions were successfully completed without causing systemic credit risk. Risk mitigation requirements through the provision of seed funding prefund or before following clearing is effective enough to minimise the risk that caused the participants to not able to complete the clearing obligation.

However, the global crisis could affect the ability of the clearing banks in meeting the obligations prefund, as occurred in one of the national banks. During 2008, the implementation of the BI-RTGS system saw an average settlement value of Rp 184 trillion (US$19.1 billion) per day; and by the level of availability, the system reached 99.9%.

Based on statistics, during the pre- and post-2008 global financial crisis period, or throughout 2007-2009, there was a decrease in settlement transaction, both in number and value, of 4 types of market: money market, bond market, foreign market and securities market. Based on volume, there was a sharp decrease in foreign exchange market and money market. In the foreign exchange market, settlement volume decreased from 180,267 transactions in 2009 to 119,262 transactions in 2009. Settlement volume in the money market also decreased; from 148,488 transactions in 2007 to 101,347 transactions in 2009. Meanwhile, the volume in two other markets, the bond and securities markets, fluctuated with a tendency to decrease. By settlement value, all 4 markets declined during the same period. Settlement value in the money market and bond market respectively decreased from USD632 billion in 2007 to USD471 billion in 2009, and from USD1,683 billion in 2007 to USD1,164 billion in 2009.

During the period 2002 -2012, the economic crisis in Indonesia was never triggered by country-specific shock. The economic crisis in Indonesia, both at the time of mini-crisis (2005) and (2008) was generally caused by the impact of external factors, such as rising oil prices and tight monetary policy of the Americans. These external factors had an impact on the exchange rate to weaken and suppress the balance of payments and fiscal mini-crisis, as happened in 2005. In the micro-scale, the emergence of "expectation-depreciation spiral" has sparked bandwagon behaviour in the purchase of foreign exchange from several corporate groups and individuals, who in turn placed increased pressure on the rupiah. To anticipate the conditions that lead to mini-crisis in the financial sector in mid-2005, BI and the government took responsive steps to minimise the effects of stress on macroeconomic instability. On the macro policy side, BI pursued a tight monetary policy, while the government embarked on measures to strengthen the sustainability of fiscal adjustment, including reducing the burden of fuel subsidies. The policy comes with the policies in micro-scale through the improvement of the foreign exchange demand and supply conditions as well as reduction of the element of speculation in foreign exchange transactions. The policy directly affects the supply of foreign currency through intervention/ sterilisation of foreign exchange.

To stem pressure on the Rupiah value, the Ministry of State Owned Enterprises together with Bank Indonesia has reached an agreement to arrange the fulfillment of Pertamina's (State Owned Oil Company) USD needs by Bank Indonesia. In addition, proceeds from exports by State Owned Enterprises must be deposited in banks located in Indonesia. BI also issued several regulations governing foreign exchange transactions of banks, which aim to minimise speculative transactions, whether conducted by resident and foreign donors. Moreover, considering the limited capacity of the domestic banks in meeting the needs of foreign exchange transactions that support the real economy, BI issued a policy of hedging swap facility. In order to support the effective management of liquidity in the money market rupiah, BI monetary instruments complement by issuing short-term swap instruments. However, such action does not mean BI inhibits the development of domestic foreign exchange market since there are no restrictions on foreign exchange for foreign currency transactions and foreign exchange derivative transactions even for the rupiah against foreign parties. The limit does not apply to all the transactions carried out to protect the value of the investment activities in Indonesia. Overall, these policies have been successful in restoring market confidence and a showed a positive impact on the Indonesian economy.

4.2 Bivariate Correlation Analysis

According to the bivariate analysis (based on data for 2002-2012) between PS to GDP and financial development indicator, the coefficient correlation exhibits a positive but insignificant correlation between liqliab and bankcred both at 5% and 1% levels, while commbank returned a negative correlation. The results show that aggregate liquidity growth is slightly affected by third- party funds as well as loan growth. This is attributable to the major influence the central bank's monetary policy has on aggregate liquidity growth. Meanwhile, receiving interest is the greatest motivation for the public to save in banks. PS to GDP and stock market development indicator shows a positive correlation coefficient between Mktcap, Valtrade and Turnover, albeit insignificant, at 5% and 1% levels. This indicates that the financial deepening in Indonesia still has a great capacity for improvement. Increase in the population's income represented by the rise in GDP does not automatically increase capital market transactions, such as in stocks and bonds. From the periods before, during and after the 2008 global financial crisis, the decrease in Mktcap and Turnover was followed by a sharp decline in aggregate liquidity in the BI-RTGS system, as shown in the appendix.

PS to GDP and External Indicator such as Export and Import of goods and services, both individually and the total of goods and services exhibits a negative

82

correlation both at 5% and 1% significance levels. This shows a lack of relationship between aggregate liquidity growth in the BI-RTGS system with the increase or decrease from Exports and Imports. See Appendix 4.

BOX 1: BIVARIATE CORRELATION ANALYSIS

Bivariate correlation analysis is a technique that seeks to establish the degree of association of the two variables and the direction of the correlation. Correlation value has ranges between 0 to 1 or 0 to -1. Positive and negative signs indicate direction of relationship. Positive sign indicates direction of unidirectional relationship. If one variable rises, the other variable so rises. Negative sign indicates the opposite relationship. If one variable rises, the other variables go down. Bivariate correlation analysis will be using formula below:

The formula, $Z = \frac{1}{2}\sqrt{N-3}\{\ln[(1+r)(1-\rho)/(1-r)(1+\rho)]\}$, is utilised to determine the significance of the coefficient of correlation [see Romano (1977, pp.156-160)] with $H_0: \rho = 0$ versus $H_A: \rho \neq 0$ and using $\alpha = 0.05, 0.01$ thus the rejection region is $Z = |\frac{1}{2}\sqrt{N-3}\{\ln[(1+r)/(1-r)]\}| > 1.96, 2.58$.

The correlation test will be performed using E-Views with details of the following variables:

- PS to GDP with Financial Data Indicators (e.g. *Liqliab, Commbank,* and *Bakcred*).
  GDP is Gross Domestic Product, and (1) *Liqliab* - the sum total of currency plus demand and interest-bearing liabilities of commercial bank and non-banks divided by nominal GDP; (2) *Commbank* - the total asset of commercial banks divided by sum of commercial bank and central bank assets; and (3) *Bankcred* - the ratio of total credit of commercial banks and other deposit-taking banks to the private sector by nominal GDP.

- PS to GDP with SMD Indicators (e.g. *MktCap; ValTrade* and *Turnover*).
  Definitions of parameters are follows: (1) *MktCap* - Total value of stocks in the domestic market divided by GDP; (2) *ValTrade* - Total Value of stock being traded by GDP; and (3) *Turnover* - Total value of stocks being traded divided by the total value of stocks listed in the domestic market; *stock price index.*

- PS to GDP with (X of goods + M of goods)/GDP

4.3 FMI Oversight and Supervisory Framework

Based on the Bank Indonesia Act, FMIs operated by BI (BI-RTGS, BI-SSSS and SKNBI) are regulated and supervised by BI. Based on the Capital Market Act and Otoritas Jasa Keuangan Act, while FMIs of capital market which are operated by private companies, such as KSEI (CSD), KPEI (CCP) and TR (BEI), are supervised by OJK (FSA). The FSA will become fully operational starting January 1, 2014 with its scope of supervision including the financial industry and other financial institutions.

To ensure the safety and efficiency of Indonesia's payment and settlement systems (PSSs), BI collects and analyses relevant information including statistical data, reviews and assesses the design and operation of each system, and encourages improvements in the PSSs. BI, where necessary and appropriate, makes changes to the BI-RTGS to facilitate improvements in these systems. BI currently still oversees the PSSs operated by BI, based on the international standards set forth in the Core Principles for Systemically Important Payment Systems (CPSIPS) and the Recommendations for Securities Settlement Systems (RSSS) by the BIS-Committee on Payment and Settlement Systems (BIS-CPSS) and International Organisation of Securities Commission (IOSCO), both of which were made public in 2001. Since 2012, BI started adjusting the current regulation with the Principles for Financial Market Infrastructures (PFMIs) published in April 2012 and Disclosure Framework and Assessment Methodology (DFAM) published in December 2012.

Oversight for the payment system operated by BI is conducted by applying the oversight guidelines published by the BIS-CPSS (2005), involving three main scrutiny activities: monitoring, assessment and inducing change. At each cycle, BI may conduct off-site and on-site visits. In the monitoring activities conducted, there are two things: firstly, monitoring the smooth operation of the BI-RTGS system, BI-SSSS system and SKNBI system. Transactions monitoring in the BI-RTGS uses multiple operational indicators as follows: firstly, monitoring operational incidents, either partial or full incident; and, secondly, monitoring the liquidity conditions at the industry level and at the level of individuals. Indicators used include: throughput guidelines, queue transactions, unsettle transactions, reject the transaction and clearing as well as the use of intraday prefund facility, and so forth. In addition to the main task of conducting surveillance, the authorities should also cooperate with other authorities, both domestic and inter-country.

Although the OJK and the BI have already signed a Memorandum of Understanding (MoU) to cooperate in some areas on October 18, 2013, views

on the regulation, supervision and oversight related to the FMIs have not been established. It is therefore necessary to prepare routine cooperation frameworks for the sharing of information and the discussion of pressing issues. Above all, it is vital to construct in advance a framework defining cooperation among the authorities concerned in the event of an urgent situation arising in order to allow for their prompt response.

Meanwhile, pursuant to the Bank Indonesia Act and Fund Transfer Act, BI may require institutions operating PSSs to provide it materials related to payments and settlements and, if necessary, request such institutions or the supervisory bodies responsible for them to take measures for improvement of their operating rules, etc. However, the lack of legal enforcement capacity to obtain timely information and to induce change may work as an impediment to the effectiveness of BI's oversight activities. In order to strengthen the legal ability of BI to obtain information and induce change, the current legal and institutional frameworks should be improved.

5. Conclusions and Recommendation

The global financial crisis in 2008 that occurred in the advanced economies was proven to have an impact on the emerging countries, including Indonesia. This is shown by the settlement decline in the bond market, money market, foreign exchange market and securities market in the BI-RTGS system. After the global financial crisis, there was a significant increase in the settlement of BI-RTGS transactions in particular types of securities markets and other markets. Fluctuation in the BI-RTGS transactions either during or since the global financial crisis showed interdependency between the global financial markets with the domestic financial market.

The global financial crisis also gave a few important lessons to the regulators, supervisors and operators of FMIs. One of the lessons that can be drawn from the recent crisis is the implications from a globally interconnected and interdependent financial market. The FMIs operated by BI were successful in ensuring reliability and mitigating risks despite the unprecedented volatility and shaken market confidence. The FMIs were successful in handling the defaults in a non-disruptive manner. The FMIs, such as the BI-RTGS system, helped in containing the materialisation of systemic risk by maintaining confidence in the settlement of the money market, bond market, foreign exchange market, securities market, etc.

There are several recommendations for the regulators, notably: the supervisory authorities should enhance their supervisory capabilities and methodologies to monitor the smoothing and security of systemically important FMIs, and to promote robust and resilient FMIs that are able to withstand future crises; the authorities should strictly monitor the liquidity conditions of the systemic direct-link participants to anticipate the transmission of financial shocks in the form of liquidity dislocations and credit losses; and the regulators and supervisors must adopt the PFMIs 2012 to capture the newer risks emerging from interconnectedness, tiering and indirect participation that, until now, have not been fully captured in the old standards. Further, research in the same topic is required but with focus on settlement transactions conducted by the other FMIs, such as those taking place in KSEI, KPEI, BEI and the Payment and Settlement Bank to see the level of interconnectedness and interdependencies among the system.

References

BIS, Committee on Payment and Settlement Systems (CPSS) – International Organisation of Securities Commissions (IOSCO), Principles for Financial Market Infrastructures, April 2012.

BIS, CPSS-ISOCO, Disclosure Framework and Assessment Methodology, December 2012.

BIS, CPSS, Central Bank Oversight of Payment and Settlement Systems.

BIS, CPSS, The Interdependencies of Payment and Settlement System.

Bank Indonesia, Annual Report, 2008.

Financial Stability Report of Bank Indonesia, September, 2009.

Financial Stability Report of Bank Indonesia, September, 2012.

Bank Indonesia, Laporan Perekonomian Indonesia, 2012.

Act of Republik Indonesia No. 7 of 1992 Concerning Banking As Amended by Act No. 10 of 1998.

Act of Republik Indonesia No. 24 of 1992 Concerning Foreign Exchange and Exchange Rate System.

Act of Republik Indonesia No. 21 of 2011 Concerning Otoritas Jasa Keuangan.

Tincthev, Kalin, (2013), "Connected to Whom? International Interbank Borrowing During the Global Crisis," *IMF Working Paper*.

List of Abbreviations

ABS	Automatic Bidding System
ATM	Automated Teller Machine
BAPEPAM-LK	Badan Pengawas Pasar Modal dan Lembaga Keuangan (Indonesia Capital Market and Non Bank Financial Institution Supervisory Agency)
BEI	Bursa Efek Indonesia (Indonesia Stock Exchange/IDX)
BI	Bank Indonesia
BidCC	Bidding System Central Computer
BIG-eB	Bank Indonesia-Government Electronic Banking
BI-RTGS	Bank Indonesia-Real Time Gross Settlement
BIS	Bank for International Settlement
BI-SSSS	Bank Indonesia-Scripless Securities Settlement System
C-BEST	Central Depository and Book Entry Settlement System
CCP	Central Counterparty
CP SIPS	Core Principles for Systemically Important Payment System
CSD	Central Securities Depository
DVP	Delivery Versus Payment
EFT POS	Electronic Funds Transfer at Point of Sale
FAFO	First Available, First Out
FIFO	First In, First Out
FLI	Fasilitas Likuiditas Intrahari (intraday collateralised liquidity facility)
FOP	Free of Payment
FSAP	Financial Sector Assessment Programme
FTS	Failure to Settle
HIMBARA	Himpunan Bank Pemerintah (association of state-owned banks)
IC	Integrated Circuit
KPEI	Kliring penjamin Efek Indonesia (Indonesia Clearing and Guarantee)

KSEI	Kustodian Sentral Efek Indonesia (Indonesia Central Securities Depository)
LVPS	Large-value Payment System
MoF	Ministry of Finance
NPG	National Payment Gateway
NSICCS	National Standard of Chip Card Specification
OMO	Open Market Operation
OTC	Over the Counter
OJKPBI	Otoritas Jasa Keuangan (Financial Services Agency)Peraturan Bank Indonesia (Bank Indonesia Regulation)
PIN	Personal Identification Number
PVP	Payment Versus Payment
SBI	Sertifikat Bank Indonesia (Bank Indonesia Certificate/the central bank bills)
SBN	Surat Berharga Negara (the government securities)
SBSN	Surat Berharga Syariah Negara (the government sharia securities)
SCC	BI-SSSS Central Computer
SEBI	Surat Edaran Bank Indonesia (Bank Indonesia Circular Letter)
SRO	Self Regulatory Organisation
SSS	Securities Settlement System
SSTS	Scripless Securities Transfer System
ST	BI-SSSS Terminal
STP	Straight Through Processing
SUN	Surat Utang Negara (the government conventional securities)
SWIPS	System Wide Important Payment System
TSA	Treasury Single Account
VPN	Virtual Private Network

List of Some of Law and Regulation for
Payment System in Indonesia

No.	Law and Regulation	Concerning
1	Law of Republic of Indonesia No.23 of 1999 as amended to date by Act No.6 of 2009	Bank Indonesia
2	Law of Republic of Indonesia No.7 of 1992 as amended to date by Act No.10 of 1998	Banking
3	Law of Republic of Indonesia No.37 of 2004	Bankruptcy and Suspension of Obligation for Payment of Debts
4	Law of Republic of Indonesia No.24 of 2004	Deposit Insurance Agency
5	Law of Republic of Indonesia No.11 of 2008	Electronic Transaction and Information
6	Law of Republic of Indonesia No.8 of 1995	Capital Market
7	Law of Republic of Indonesia No.24 of 2002	Government Securities
8	Law of Republic of Indonesia No.19 of 2008	Government Sharia Securities
9	Bank Indonesia Regulation No.10/6/PBI/2008	BI-RTGS
10	Bank Indonesia Circular Letter No.12/1/2010	BI-RTGS
11	Bank Indonesia Regulation No.10/2/PBI/2008	BI-SSSS
12	Bank Indonesia Regulation No.12/12/PBI/2010	BI-SSSS
13	Bank Indonesia Circular Letter No.12/12/DASP	BI-SSSS
14	Bank Indonesia Regulation No.7/18/PBI/2005	BI-SKNBI
15	Bank Indonesia Circular Letter No.12/34/DASP	BI-SKNBI

Overview of the Oversight and Supervision Framework for Systemic FMIs

SN	FMI Type	Ownership	FMI	Authorisation, Designation, or Licensing	Oversight by Bank Indonesia	Supervision by Govermental Agencies	On-site Inspection
1	Payment System	Public	RTGS (Real Time Gross Settlement System)	Pursuant to BI Act No.23/1999, Bank Indonesia has power to regulate, issue licence, oversee and operate.	Payment System Policy and Supervision Department (DKSP) at Bank Indonesia	BI	Payment System Oversight Division at DKSP
		Public	SKNBI (Sistem Kliring Nasional Bank Indonesia)	Pursuant to BI Act No.23/1999, Bank Indonesia has also to regulate, issue licence, oversee and operate clearing system.		BI	Payment System Oversight Division at DKSP
2	Securities Settlement System	Public	BI-SSSS (Scripless Securities Settlement System)	There are 3 acts to regulate SSS: - Act No. 24 of 2002 on Government Bond - Act No. 19 of 2008 on Syariah Government Bond - Act No. 23 of 1999 on Bank Indonesia		BI	Payment System Oversight Division at DKSP
3	CSD	Private	KSEI (C-BEST)	Act No. 8 of 1995 on Capital Market	Otoritas Jasa Keuangan (FSA)	OJK (FSA)	OJK (FSA)
4	CCP	Private	KPEI (E-Clear)	Act No. 8 of 1995 on Capital Market	Otoritas Jasa Keuangan (FSA)	OJK (FSA)	OJK (FSA)
5	TR	Private	KSEI (C-BEST)	Act No. 8 of 1995 on Capital Market	Otoritas Jasa Keuangan (FSA)	OJK (FSA)	OJK (FSA)

Appendix 3

Interbank Payments System in Indonesia

No.	Types of Payment	Payment Systems		Settlement	
		Name	Method of Settlement	Central Bank Money	Commercial Bank Money
1	Interbank large-value credit funds transfer	BI-RTGS	Gross	V	-
2	Interbank retail credit funds transfer	SKNBI	Net	V	-
3	Interbank paper-based debit payments with the instruments of cheques, bilyet giro and other debit notes	SKNBI	Net	V	-
4	Shared ATM network (domestic)	ATM Bersama	Net	V	-
		PRIMA /ATM BCA	Net	-	V
		ALTO	Net	-	V
		ATM Link	Net	V	
5	Shared ATM network (international)	Cirrus	Net	-	V
		Plus	Net	-	V
6	Shared debit-card network (domestic)	Debit PRIMA	Net	-	V
7	Shared debit-card network (international)	Maestro	Net	-	V
		VISA Electron	Net	-	V
8	Proprietary debit-card network (domestic)	Debit BCA	Overbooking		V
9	Credit card	Visa	Net	-	V
		Mastercard	Net	-	V
		JCB	Net	-	V
		BCA	Net	-	V
10	Proprietary credit-card network (domestic)	BCA	-	-	V
11	Electronic Money	Internal system of the issuers	-	-	-
12	Remittance (domestic)	Internal system of the operators (i.e. postal co., telco. co's and others)	-	-	-
13	Remittance (international)	Internal system of the operators (i.e. Western Union and MoneyGram)	-	-	-
14	Funds legs of securities transactions on IDX or OTC	PT. KSEI and its settlement banks	Net or Gross	-	Commercial Bank

Description of Major FMIs in Indonesia

No.	DESCRIPTION	BI-RTGS	BI-SSSS	BI-SKNBI	KSEI (C-BEST)	KPEI (E-CLEAR)
1	Type of FMI	PS	SSS	PS	CSD+TR	CCP
2	Operated since	2000	2000	2005	1998	1998
3	Owner	BI	BI	BI	Private	Private
4	Operated by	BI	BI	BI	Private	Private
5	Oversight/supervision	BI	BI	BI	OJK(FSA)	OJK(FSA)
6	Direct Participants	- 146 banks - 41 BI - 4 Non-bank	- 137 banks - 14 Non-bank - 16 Sub-registry	- 140 banks - BI	NA	NA
7	Operating hours	06.30 – 17.00	06.30 – 17.00	06.30 – 17.00	NA	NA
8	Settlement mechanism and services	BI-RTGS system settles all payments on a gross basis and in real time	BI-SSSS is an electronically securities settlement, depository and bidding system that enables each of its members to electronically transfer its securities to the other members and conduct securities transactions with Bank Indonesia.	-The multilateral netting for the interbank debit payments -The multilateral netting for the interbank credit funds transfers.	Custodian for transactions of stock, bond, mutual fund, and settlement services for transaction of IDX and OTC.	- Exchange Transaction Clearing Services -
9	Cross Border Connectivity	PvP Link with CHAT Hongkong	NA	NA	NA	NA
10	Avg transaction/day					
	a. 2011:					
	- GDP (Billion Rp)a)	7.422.781	7.422.781	7.422.781	7.422.781	7.422.781
	- Value (Billion Rp)	270.939	125.160	7.946	NA	NA
	- Value/GDP (%)	3,65	1,69	0,11	NA	NA
	- Value (Million USD)	29.879	13.802	876	NA	NA
	- Frequency (times)	65.451	448	459.677	NA	NA
	b. 2012 :					
	- GDP (Billion Rp)b)	8.241.864	8.241.864	8.241.864	8.241.864	8.241.864
	- Value (Billion Rp)	404.053	132.123	8.821	NA	NA
	- Value/GDP (%)	4,90	1,60	0,11	NA	NA
	- Value (Million USD)	41.923	13.709	915	NA	NA
	- Frequency (times)	71132	558	431.293	NA	NA

Source: BPS-Indonesia Statistics.
a) Very Preliminary Figure.
b) Very Very Preliminary Figure.
NA = Not Available.

Appendix 5

Results of Bivariate Correlation Analysis

		PStoGDP	Liqliab	Commbank	Bankcred	Mktcap	ValTrade	Turnover	ElGoodsOnly	ElGoods Services	ElGoods Only toGDP	ElGoods Services to GDP
PStoGDP	Pearson Correlation	1	,258	-,136	,151	,191	,523	,383	,071	,074	-,245	-,159
	Sig. (2-tailed)		,444	,690	,657	,574	,099	,244	,836	,829	,468	,640
	N	11	11	11	11	11	11	11	11	11	11	11
Liqliab	Pearson Correlation	,258	1	-,681*	-,103	-,449	-,110	,115	-,649*	-,657*	,146	,322
	Sig. (2-tailed)	,444		,021	,764	,166	,747	,735	,031	,028	,668	,334
	N	11	11	11	11	11	11	11	11	11	11	11
Commbank	Pearson Correlation	-,136	-,681*	1	,657*	,435	,561	,381	,893*	,894*	-,500	-,676*
	Sig. (2-tailed)	,690	,021		,028	,181	,073	,247	,000	,000	,117	,022
	N	11	11	11	11	11	11	11	11	11	11	11
Bankcred	Pearson Correlation	,151	-,103	,657*	1	,612*	,682*	,481	,743*	,738*	-,536	-,632*
	Sig. (2-tailed)	,657	,764	,028		,045	,021	,135	,009	,010	,089	,037
	N	11	11	11	11	11	11	11	11	11	11	11
Mktcap	Pearson Correlation	,191	-,449	,435	,612*	1	,268	-,150	,622*	,617*	-,544	-,647*
	Sig. (2-tailed)	,574	,166	,181	,045		,425	,659	,041	,043	,084	,031
	N	11	11	11	11	11	11	11	11	11	11	11
ValTrade	Pearson Correlation	,523	-,110	,561	,682*	,268	1	,888**	,580	,586	-,254	-,333
	Sig. (2-tailed)	,099	,747	,073	,021	,425		,000	,062	,058	,450	,317
	N	11	11	11	11	11	11	11	11	11	11	11
Turnover	Pearson Correlation	,383	,115	,381	,481	-,150	,888**	1	,353	,357	-,007	-,053
	Sig. (2-tailed)	,244	,735	,247	,135	,659	,000		,287	,281	,983	,877
	N	11	11	11	11	11	11	11	11	11	11	11
ElGoodsOnly	Pearson Correlation	,071	-,649*	,893**	,743**	,622*	,580	,353	1	1,000**	-,435	-,620*
	Sig. (2-tailed)	,836	,031	,000	,009	,041	,062	,287		,000	,181	,042
	N	11	11	11	11	11	11	11	11	11	11	11
ElGoodsServices	Pearson Correlation	,074	-,657*	,894**	,738**	,617*	,586	,357	1,000**	1	-,426	-,611*
	Sig. (2-tailed)	,829	,028	,000	,010	,043	,058	,281	,000		,191	,046
	N	11	11	11	11	11	11	11	11	11	11	11
ElGoodsOnly toGDP	Pearson Correlation	-,245	,146	-,500	-,536	-,544	-,254	-,007	-,435	-,426	1	,965**
	Sig. (2-tailed)	,468	,668	,117	,089	,084	,450	,983	,181	,191		,000
	N	11	11	11	11	11	11	11	11	11	11	11
ElGoodsServicestoGDP	Pearson Correlation	-,159	,322	-,676*	-,632*	-,647*	-,333	-,053	-,620*	-,611*	,965**	1
	Sig. (2-tailed)	,640	,334	,022	,037	,031	,317	,877	,042	,046	,000	
	N	11	11	11	11	11	11	11	11	11	11	11

Appendix 6

Market Value BI-RTGS on Annual Basis (Billion US$)

	MONEY MARKET	BOND MARKET	FOREX MARKET	SECURITIES MARKET	OTHER	TOTAL
2002	229	712	167	12	389	1
2003	221	1,454	165	10	548	2
2004	230	1,343	230	60	626	2
2005	301	626	253	83	742	2
2006	452	1,072	284	134	1,161	3
2007	632	1,683	432	274	1,533	4
2008	373	1,164	341	175	1,511	3
2009	471	917	284	175	1,788	3
2010	525	2,568	374	263	2,290	6
2011	596	3,394	391	231	2,767	7
2012	484	6,178	283	222	2,983	10,

Market Value BI-RTGS on Monthly Basis (Billion US$)

YEAR	MONTH	MONEY MARKET	BOND MARKET	FOREX MARKET	SECURITIES MARKET	OTHERS	TOTAL
2010	Jan	36	210	27	18	160	
	Feb	40	197	24	17	149	
	Mar	50	201	36	27	183	
	Apr	49	247	39	28	189	
	Mei	49	136	30	25	172	
	Jun	48	169	39	30	197	
	Jul	46	179	28	19	198	
	Ags	50	138	31	20	192	
	Sep	42	160	31	16	184	
	Okt	39	225	31	22	201	
	Nov	36	282	28	19	206	
	Dec	36	425	31	20	262	
2011	Jan	50	281	34	21	211	
	Feb	44	153	30	16	183	
	Mar	50	220	38	21	220	
	Apr	50	153	37	20	206	
	Mei	59	169	38	18	214	
	Jun	59	255	36	22	219	
	Jul	58	237	33	18	234	
	Ags	39	321	37	20	239	
	Sep	41	340	36	22	243	
	Okt	51	355	25	18	242	
	Nov	53	395	24	16	248	
	Dec	43	515	22	18	307	
2012	Jan	26	794	27	18	226	1,
	Feb	23	772	23	23	221	1,
	Mar	24	756	20	18	237	1,
	Apr	26	756	22	11	226	1,
	Mei	55	632	23	16	259	
	Jun	68	399	25	23	270	
	Jul	53	393	27	23	259	
	Ags	51	320	25	18	241	
	Sep	35	368	25	19	234	
	Okt	51	300	27	16	257	
	Nov	37	310	22	19	255	
	Dec	33	379	18	18	299	
2013	Jan	38	384	23	15	257	
	Feb	39	284	30	16	243	
	Mar	44	253	31	31	238	
	Apr	55	328	39	23	285	
	Mei	57	333	36	22	296	
	Jun	53	266	32	22	351	

Chapter 4

FINANCIAL MARKET INFRASTRUCTURE INTERDEPENDENCIES IN KOREA

By
Jongsang Lee
and
Seungjin Baek[1, 2]

1. Introduction

The nominal GDP of Korea was US$ 1,129 billion in 2012, and the volume of exports and imports was 1.1 times GDP. The payment amount processed by select interbank funds transfer systems was 58 times larger than the GDP. In Korea, the moderate economic growth has continued with an increase in exports recently, and the rate of GDP growth for 2013 is projected to be 2.8%. Korea's consumer price inflation meanwhile is running at a low level as well.

Table 1
Statistics of Korean Economy in 2012[1)]

Economy[2)] (bil. US$)	Pop (mil.)	Area (sq. km)	GT	KA	EI	FD	PST	PS
1,129	50	100,188	C (peninsula)	C	1.1	1.1	58.0	44.3

Notes: 1) "**GT**" is Geographical type (A. Island; B. Landlocked; and C. Neither A nor B);
  "**KA**" is Capital Account (A. Not liberalised; B. Partially liberalised; C. Fully liberalised);
  The External Integration ("**EI**") indicator is (X of goods and services + M of goods and services)/ GDP;
  The Financial Development ("**FD**") indicator is the ratio of total credit of deposit-taking banks to the private sector over GDP;
  "**PST**" is Payments processed by select interbank funds transfer systems (i.e. BOK-Wire+, Check Clearing System, Interbank Shared Networks) over GDP;
  "**PS**" is Payments processed by BOK-Wire+ over GDP.
  2) Converted to US$ based on yearly average US$/KRW exchange rate.
Source: BOK, Korean Statistical Information Service.

_____

1. Jongsang Lee is Manager, Payment and Settlement Systems, Bank of Korea and Seungjin Baek is Deputy Manager, Payment and Settlement Systems Department, Bank of Korea.

2. The views expressed herein are those of the authors and do not necessarily reflect the official views of the Bank of Korea or The SEACEN Centre.

Table 2
Key Economic Indicators

	2010	2011	2012				2013		
			I	II	III	IV	I	II	III
KOSPI[1]	1,765	1,983	1,973	1,910	1,902	1,940	1,985	1,932	1,918
GDP growth (%)[2]	6.3	3.7	0.8	0.3	0.0	0.3	0.8	1.1	..
Unemployment rate (%)	3.7	3.4	3.8	3.3	3.0	2.8	3.6	3.1	3.0
Consumer prices (%)[3]	3.0	4.0	3.0	2.4	1.6	1.7	1.4	1.1	1.2

Notes: 1) Period-average.
      2) Rates of increase compared with the previous periods.
      3) Rates of increase compared with the same periods of the previous years.

Source: BOK.

Table 3
Economic Growth Forecasts
(year-on-year, %)

	2012	2013			2014[e]		
	Year	H1	H2[e]	Year[e]	H1	H2	Year
GDP	2.0	1.9	3.6	2.8	3.9	3.7	3.8
Private consumption	1.7	1.6	2.1	1.9	3.3	3.3	3.3
Goods exports	3.8	5.3	5.7	5.5	4.8	9.4	7.2
Goods imports	1.5	3.3	4.3	3.8	3.8	9.8	6.9

Source: "Economic Outlook for 2013 and 2014" (BOK press release, Oct. 2013).

The US$/KRW exchange rate, which is freely floating[3], has generally exhibited stable movements since April 2009. In 2013, the volatility of the US$/KRW exchange rate has increased somewhat, owing mostly to the emergence of geopolitical risks, to the increasing volatility of the Japanese yen, and to fears of early QE tapering by the US Federal Reserve. It has subsided again since August, however, as the influences of QE tapering concerns have been limited due, for example, to expectations that the effects of the tapering will differ across the emerging economies.

_____

3.   The Foreign Exchange Transactions Act, which allows all foreign exchange transactions to be carried out freely and regulates exceptionally only those deemed necessary (a negative system), came into effect starting from 1999, and the requirement of permission for capital transactions was shifted to one of simple reporting of them from 2006.

Chart 1
US$/KRW Exchange Rate
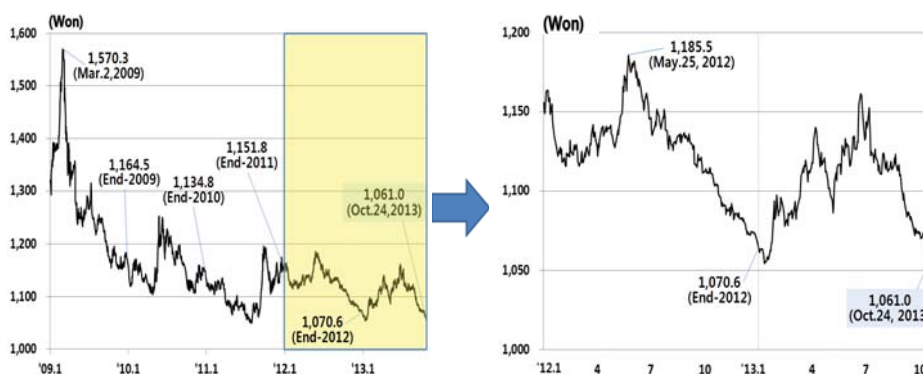
Source: BOK.

2. Financial Market Infrastructures in Korea[4]

2.1. General Policy and Regulation Framework

Concerning the Financial Market Infrastructures (FMIs) in Korea, there is a broad range of laws and regulations — governing transactions and the settlement details thereof, oversight of the payment and settlement systems, legal protection for clearing and settlement agreements, etc.

The FMIs are regulated, supervised and overseen by the Financial Services Commission (FSC) and the Bank of Korea (BOK), based on statutory law. The regulation and supervision of the FSC is based on the Financial Investment Services and Capital Markets (FISCM) Act. Meanwhile, the BOK Act, the FISCM Act and the Electronic Financial Transactions (EFT) Act, among others, stipulate that the BOK shall play a role in overseeing payment and settlement systems (PSSs).

---

4. To facilitate oversight efficiency, the BOK has designated the systems whose malfunctioning could trigger spillover effects throughout the financial system or cause serious financial system disruptions as Systemically Important Payment and Settlement Systems (SIPSs) corresponding to the FMIs under the Principles for Financial Market Infrastructures (PFMIs).

Table 4
Laws Relating to Korean Payment and Settlement System

Contents			Law
Transactions	Commercial Transactions		Civil Act Commercial Act Standardised Contracts Act Electronic Financial Transactions Act
		Securities Exchange	Financial Investment Services and Capital Markets Act
		Foreign Exchange	Foreign Exchange Transactions Act
Supervision and Oversight Function			Bank of Korea Act Civil Act Electronic Financial Transactions Act Financial Investment Services and Capital Markets Act
Settlement Finality			Debtor Rehabilitation and Bankruptcy Act

2.2. Stylised Facts of FMIs

In Korea, the FMIs refer to BOK-Wire+ of the BOK, the Retail Payment Systems (RPSs) of the Korea Financial Telecommunications and Clearings Institute (KFTC), the securities-related FMIs operated by the Korea Exchange (KRX) and Korea Securities Depository (KSD), and the *Continuous Linked Settlement* (CLS) System.

BOK-Wire, operated by the BOK, is a real-time gross settlement system (RTGS) which uses not only an RTGS mechanism but a hybrid settlement mechanism[5] as well, providing fund settlements for short-term financial market transactions and for securities and foreign exchange transactions. BOK-Wire+ provides a funds transfer service via participants' deposit accounts for settlement with the BOK. BOK-Wire+ also carries out the final settlement of transactions through other PSSs linked with it.

The KFTC is a non-profit organisation set up on a joint ownership basis by the BOK and commercial member banks. The KFTC operates the three important retail payment systems[6] and the other nine retail payment systems[7]. As customers

---

5. It combines the characteristics of the RTGS and netting systems by adding bilateral and multilateral offsetting features to the RTGS system.

6. The Interbank Remittance System, Electronic Banking System and Check Clearing System.

7. The Giro System, ATM Network, Electronic Funds Transfer at the Point of Sale System, Cash Management Service (CMS) System, Local Banks Shared System, Electronic Money (K-CASH) System, Business-to-Customer (B2C) Electronic Commerce Payment System, Business-to-Business (B2B) Electronic Commerce Payment System, and Cross-border ATM Network.

request funds transfers through their financial institutions during the day, the KFTC calculates financial institutions' total intraday transactions in each system and determines their multilateral net settlement obligations. It notifies the BOK and financial institutions of the results by the pre-arranged notification times, and the BOK then completes the settlement by conducting fund transfers across the financial institutions' accounts with the BOK at the designated net settlement times. The settlement risks among participants are managed by the BOK through various arrangements such as net debit caps, collateral requirements, and loss-sharing arrangements.

The KRX serves as the Central Counterparty (CCP) by providing services such as matching and confirmation of trades, clearing, assumption of obligations and guarantees of settlement. Securities settlements are in general finalised through the KSD's securities accounts, with the fund settlements made through the accounts of the BOK and commercial banks.

The CLS Bank provides a Payment versus Payment (PvP) settlement service for foreign exchange transactions by linking up with BOK-Wire+.

Table 5
FMIs in Korea

FMI Type		Name	Description
Payment Systems		BOK-Wire+ (RTGS System)	Operated by the BOK
		Interbank Remittance System, Electronic Banking System, Check Clearing System[1]	Operated by the KFTC[2], a non-profit corporation owned jointly by the BOK and private commercial banks
		CLS System	CLS Bank designated the KRW as a CLS eligible currency in December 2004, and from that time began providing PvP settlement services for foreign exchange transactions by linking up with BOK-Wire+.
Market-related FMIs	CSD (Security Settlement System)	KOSPI and KOSDAQ Market Settlement Systems, Institutional Settlement System of Bonds	Korea Securities Depository (KSD), a company with the Korea Exchange (KRX), financial investment companies and banks participating as its stockholders, takes deposits of both floor-traded and over-the-counter (OTC) securities including bonds and stocks.
	CCP	KOSPI and KOSDAQ Market Settlement Systems, Derivatives Market Settlement System	Operated by the KRX, with financial investment companies and related institutions participating as its stockholders

Notes: 1) The three SIPs among the 12 retail payment systems operated by the KFTC, which are FMIs in accordance with the PFMIs.
2) The settlement risks among participants are managed by the BOK.

2.3 Mapping Interdependency of Payment and Settlement Systems[8]

The RPSs provide a wide range of services, including corporate fund transfers and fund transfers between individual customers. Some of the funds for the financial market transactions among the financial institutions are also transferred through the RPSs.

As for securities settlements, the KRX operates the Korea Composite Stock Price Index (KOSPI), Korean Securities Dealers Automated Quotations (KOSDAQ) and Derivatives Markets in accordance with the FISCM Act. The KRX operates the securities-related FMIs together with KSD, to clear and settle transactions conducted in the aforementioned markets. As the CSD, KSD mainly provides centralised depository and securities settlement services through book-entry transfers.

In the case of foreign exchange payments through the CLS Bank's PvP system, the amounts in each currency are multilaterally netted among the members of the CLS Bank and then settled through BOK-Wire+ and the large-value payment systems operated by the other central banks whose nations' currencies are eligible for CLS.

_____

8. As the RPSs are linked with BOK-Wire+ and provide a wide range of services including corporate fund transfers and fund transfers between individual customers, along with some fund transfers among the financial institutions for financial market transactions, we classify the RPSs in a category separate from the other financial markets in this report.

<p style="text-align:center">Table 6</p>
<p style="text-align:center">Mapping Interdependency of Payment and Settlement Systems</p>

Markets		Clearing	Settlement	
			Funds	Securities
Retail Payment systems	Interbank Remittance System, Electronic Banking System, Check Clearing System, etc.	KFTC	BOK-Wire+	-
Money Markets[1]	Repos (exchange-traded market)	KRX	BOK-Wire+	KSD
	CDs, CP, Repos (OTC markets)	-		
Bond Markets	Government bonds, (exchange-traded market)	KRX	BOK-Wire+	
	General bonds[2] (exchange-traded market)		Commercial banks	
	Bonds (OTC markets)[3]	-	BOK-Wire+	
Stock Markets	KOSPI and KOSDAQ Markets (exchange-traded markets)	KRX	BOK-Wire+	
	Institutional Settlement System of Stocks[4] (OTC markets)	KSD		
Foreign Exchange Market[5]		CLS Bank	BOK-Wire+	-
Derivatives Market[6] (exchange-traded market)		KRX	Commercial banks	-

Notes: 1) Call transaction settlements not included, as they are settled within BOK-Wire+ and not on a separate system

2) Corporate and small-value government bonds, etc.

3) Bonds are more heavily traded in the OTC market than in the exchange-traded market. In the OTC   market, bond transactions are settled on T+1 using a DVP model 1 arrangement, and KSD mainly provides centralised depository and securities settlement services through book-entry transfers.

4) Settlement between KRX members (brokers) and non-member institutional investors.

5) This is based on the CLS System. There is also another foreign exchange settlement system: comprising the foreign currency fund transfer systems, for provision of foreign currency fund transfers between local financial institutions, provided by several commercial banks. This system is not included in this report, however, because it is not linked systemically with BOK-Wire+.

6) The FSC revised the FISCM Act in April 2013 as a part of the global financial reform measures, thus seeking to establish an OTC Derivatives CCP.

2.4 FMI Oversight and Supervisory Authorities

The FSC serves as the regulator and supervisor of the FMI operators and payment service providers. Pursuant to the FISCM Act, the FSC regulates and supervises the FMIs operated by the KRX and KSD. The FSC has the power to approve the articles of incorporation and the business rules regarding clearing and settlement services of the KRX and KSD, as well as to enforce necessary actions by them. As one of the authorities for the supervision of non-profit organisations set up under the Civil Act, the FSC also has the power to supervise the KFTC's general business operations. Meanwhile, the BOK participates in the decision-making process of the KFTC, as chair of the General Meeting of the KFTC.

Pursuant to Article 81 of the BOK Act and its sub-regulations, the BOK conducts oversight of all PSSs, including the RPSs, the CCP, the CSD and the CLS system, in order to maintain their safety and efficiency. There are no restrictions on the scope of the BOK's oversight under the BOK Act. The BOK Act stipulates the responsibilities and authority of the BOK related to the PSSs in Articles 28 and 81, thus enabling the BOK to oversee and make recommendations to the PSS operators. Article 88 of the Act states that the BOK may request that the FSS carry out examinations of financial institutions, jointly with the BOK, if the Monetary Policy Committee (MPC) deems this necessary for implementing its monetary policies.

Table 7
FMI Oversight and Supervisory Authorities

FMI Type	Ownership[1]	Name of FMI	Authorisation, Designation, or Licensing	Oversight	Supervision	Onsite Inspection
Payment Systems	Public	BOK-Wire+	-	BOK	-	-
	Private, non-profit organisation (KFTC)	Interbank Remittance System, Electronic Banking System, Check Clearing System (RPSs)	FSC, the Ministry of Justice, BOK[2]	BOK	FSC and the Ministry of Justice, etc.[4]	FSC (FSS)
	Private (CLS Bank)	CLS System	Ministry of Strategy and Finance, BOK[2]	BOK[3]	-	-
CSD (SSS)	Private (KSD)	Institutional Settlement System of Bonds, KOSPI and KOSDAQ Market Settlement Systems	FSC, BOK[2]	BOK	FSC	FSC (FSS)
CCP	Private (KRX)	KOSPI and KOSDAQ Market Settlement Systems, Derivatives Market Settlement System				

Notes: 1) Institutions in ( ) are the FMI operators.
2) To facilitate oversight efficiency, the BOK has designated the systems whose malfunctioning can trigger spillover effects throughout the financial system or cause serious financial system disruptions as SIPSs.
3) In accordance with a cooperative oversight arrangement, central banks whose currencies are settled through the CLS Bank are jointly responsible for its oversight, with the US Federal Reserve the lead overseer.
4) As one of the authorities for the supervision of non-profit organisations set up under the Civil Act, the FSC has the power to supervise the KFTC's general business operations, while the Ministry of Justice, as the ministry responsible for electronic bill management, conducts supervision of the electronic bill operation units of the KFTC. The BOK participates in the decision-making process of the KFTC, the RPSs' operator, as chair of the KFTC General Meeting.

2.5. Domestic Implementation of PFMIs

Since the publication of the PFMIs by the Committee on Payment and Settlement Systems and the International Organisation of Securities Commissions (CPSS-IOSCO) in in April 2012, the BOK has devoted efforts to PFMI implementation. To implement the PFMIs, the BOK amended its 'Regulation on Operation and Management of the Payment Systems' to change the oversight criteria from the original international standards to the PFMIs in December 2012. The BOK has also conducted gap analyses of the domestic FMIs and the related authorities over them, focusing on the newly added and strengthened principles and authorities' responsibilities related to the PFMIs.

Through discussions with the FMI operators, the BOK plans to prepare a detailed methodology for assessment that will provide more specific guidelines than the PFMIs. In 2013, the BOK has begun conducting sequential assessments of the FMIs, in accordance with the PFMIs and with its own detailed assessment criteria.

3. Financial Statistics in Korea[9]

3.1 Participants in FMIs[10,11]

Financial institutions participate in the FMIs to conduct various financial transactions. Banks and financial investment companies, in particular, play critical roles in the FMIs and have large effects on them.

First, banks are major participants in BOK-Wire+ as well as in the other FMIs, including the RPS, the CCP, the CSD and the CLS system. Banks account for 57.6% of settlements made through BOK-Wire+ and 87.3% of those through the RPSs, and only banks can participate in the CLS system. They play an important role in the SSSs as well, accounting for 1.7% and 19.4% of the outstanding amounts deposited at the KSD of stocks and bonds, respectively[12].

_____

9. As BOK-Wire+ is used to make final settlements of various financial transactions settled through the FMIs, we examine the interdependency among these FMIs on the basis of the BOK-Wire+ settlement statistics. Along with the statistics on the systems that the BOK designated as systemically important systems corresponding to the FMIs under the PFMIs, we include the statistics on the other systems linked with BOK-Wire+ for broad analysis.

10. Refer to Appendix 2 for more detailed statistics.

11. The statistics on participants' shares in total BOK-Wire+ and RPS settlements are based on April 2013.

12. As of end-2012; on a domestic bank basis.

Financial investment companies are not only direct participants in BOK-Wire+ but are also major participants of the CCP and the CSD for exchange-traded and OTC securities settlement. These companies account for 80.6 and 17.7%, respectively, of the outstanding amounts of stocks and bonds deposited at KSD[13]. They also account for 33.0% of settlements made through BOK-Wire+, the second largest share after that of banks. Moreover, they have participated indirectly in the RPSs via agency banks since 2009, and are involved in 3.3% of the settlements through those systems.

Meanwhile, insurance companies put considerable amounts of their investment assets into securities and loans, and account for 1.2 and 15.8%, respectively, of the outstanding amounts of stocks and bonds deposited at KSD[14]. They do not participate in the RPSs or the CLS system, however, and account for only a small portion (0.4%) of settlements made through BOK-Wire+, and thus have little influence on the FMIs.

Most financial institutions in Korea participate in more than one FMI, depending upon the financial transactions involved. Fifty-five institutions participate in the RPSs, 119 in the money and bond markets (where transactions are mostly traded OTC), 36 in the CLS system, and 75 in the stock market. Eighteen institutions, including some local banks and foreign bank branches, participate in all of the RPSs and the money, FX, bond and stock markets. Financial institutions' participation in multiple FMIs acts as a factor deepening the interdependency among FMIs centering around BOK-Wire+. For instance, difficulties in operation or delays in settlement at large financial institutions may affect the other FMIs including BOK-Wire+ and other participants.

Although most participants participate directly, some participate indirectly via settlement agencies in the RPSs, the KOSPI and KOSDAQ markets, and the CLS system. Thirty institutions including financial investment companies participate in the RPSs via agency banks, 27 institutions participate in the KOSPI and KOSDAQ markets via securities companies that are settlement members, and 14 institutions, including third-party banks, participate in the CLS Bank via settlement members.

---

13. As of end-2012.
14. As of end-2012.

Chart 2
Numbers of Participants per FMI among BOK-Wire+ Participants
(As of end-2012)
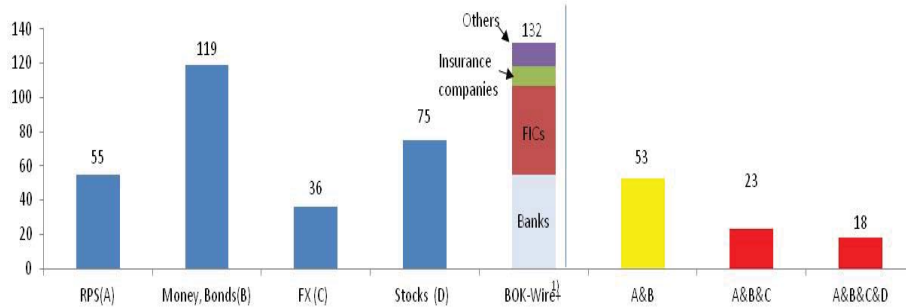
Note: 1) 55 Banks (including 37 foreign bank branches), 52 FICs (financial investment companies), 11 insurance companies, 14 other institutions.
Source: BOK, KRX, KSD.

Chart 3
FMI Participation by Major Financial Institutions
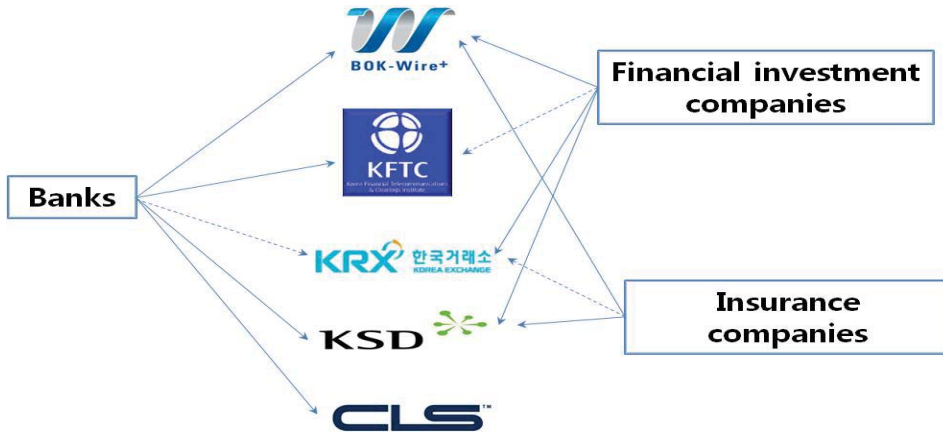
Note: 1) ------▸ represents indirect participants.

3.2 Transfers of FMIs through BOK-Wire+[15]

When we look at the magnitude of interdependency[16] in terms of the amount of each type of transaction settled through BOK-Wire+, we find that FMI-linked settlements accounted for 29.2% of the total amount settled through BOK-Wire+ in 2012, a 13.9 percentage point increase from the 15.3% figure in 2005. This is because the amount of repo settlements in the money market has increased greatly[17], while that of the other FMI-linked settlement has not shown significant changes. The largest financial transaction settlement amount is that linked to the money market, followed by those linked to the RPS, the bond, the FX and the stock markets. Unlike the money and bond markets, where gross trade-for-trade settlements generally take place, settlements for the RPS, the stock and the FX markets are net-basis. Therefore, the actual influence of linkages in these markets may be larger than their settlement amounts. Net settlements, which are broadly used for the RPS, stock and FX markets, have a huge advantage in saving settlement liquidity, since the related transfer instructions among financial institutions are accumulated until a certain time and only the net amount of receipts and payments is then settled. Net settlements are therefore widely used as settlement means in the financial markets. However, if the risks related to net settlement are not managed appropriately, the defaults of some financial institutions may affect other institutions.

_____

15. Refer to Appendix 3 for more detailed statistics.

16. Based on the settlement values of several different FMIs (i.e., in the money, bond, FX markets, etc.) processed through BOK-Wire+, divided by the total BOK-Wire+ settlement value.

17. The sharp surge in inter-institutional repo trading owes mainly to the changing patterns of trade among asset management firms and financial investment companies. Many call transactions have been replaced by institutional repo transactions, in line with the efforts for structural improvement of the short-term financial markets.

Chart 4
Trends of Settlement between FMIs and BOK-Wire+

(Proportions of FMI settlement in BOK-   (Settlement value of each FMI[2])
Wire+[1])
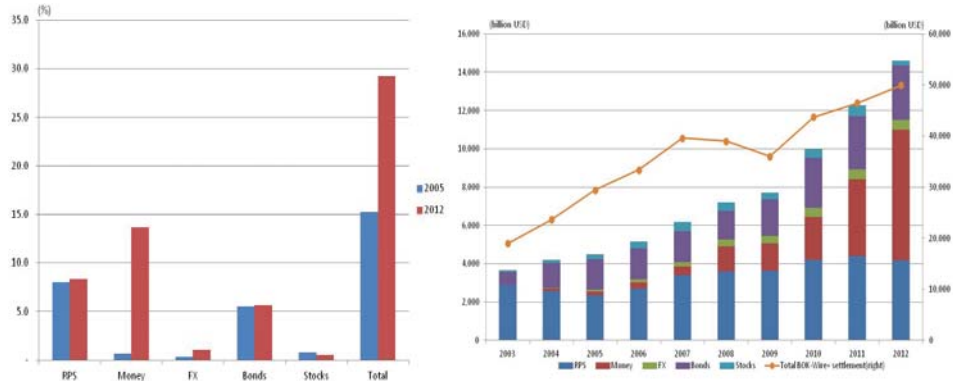
Notes: 1) Value of settlement between each market FMI and BOK-Wire+ / Total BOK-
Wire+ settlement value
2) Value of settlement between each market FMI and BOK-Wire+
Sources: BOK, KRX, KSD.

Chart 5
FMIs' Settlement through BOK-Wire+ in 2012
(Billion US$[1], %[2])
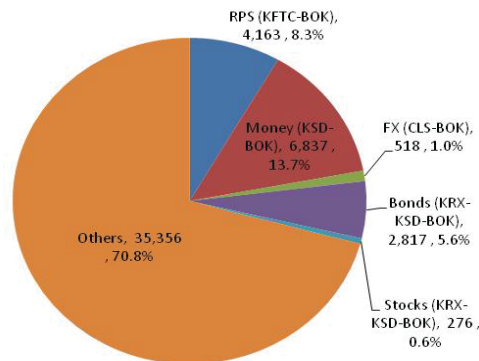
Notes: 1) Value of settlement between each market FMI and BOK-Wire+.
2) Value of settlement between each market FMI and BOK-Wire+/ Total BOK-Wire+
settlement value.
3) RPSs: Final settlements of participants' net positions resulting from customer
funds transfers of twelve RPSs, which take place through BOK-Wire+.
4) Others: Call settlement funds, general fund transfers between participants, fund
transfers between BOK and participants, etc.
Sources: BOK, KRX, KSD.

110

Since most financial institutions have current accounts with the BOK and are participating directly in financial transaction settlement, as was shown in Sub-section 3.1 - Participants in FMIs", the share of settlements through indirect participation is small. First, the settlement amount of the financial investment companies which have participated indirectly in the RPSs since 2009 stood at US$ 122 billion in 2012, making up 0.2% of the total BOK-Wire+ settlement amount. In addition, although the indirect settlement amounts in the KOSPI and KOSDAQ markets and the CLS system are unavailable, they do not seem to be large, given the shares of the stock and FX settlement systems linked with BOK-Wire+ in the total BOK-Wire+ settlement value (0.6% and 1.0%, respectively, in 2012). Meanwhile, the CLS system is the representative cross-border FMI, and is linked with the central banks of participating countries issuing the currencies settled through the CLS system.[18]

As seen here, the FMIs in Korea are closely linked, centering on BOK-Wire+, and show strong interdependency. The securities-related FMIs, the CCP and the CSD (SSS), adopt Delivery versus Payment (DvP) schemes, in which settlements are conditional on other settlements, and funds are settled by linking KSD and BOK-Wire+, and there is also a linkage between the KRX and KSD. Principal risks can be eliminated as a result, but operational risks can affect other systems through BOK-Wire+. And it is very difficult for the clearing and settlement functions carried out by the RPSs, the CCP and the CSD to be replaced by those of other financial institutions. Since the KRX acts as the CCP for participants, any default of the KRX may cause systemic risk. If clearing through the system is delayed due to the occurrence of securities settlement system failure, settlements carried out at the BOK-Wire+ closing time may increase or there may be a disruption in settlement, thus affecting other FMIs.

3.3 Finance-related Development Indicators in Korea

The financial market structure in Korea has gradually diversified and grown, bolstered by the expanding demand for financial services by economic agents in line with the rising sophistication of the industrial structure and increases in income, and by the improved financial transaction techniques of market participants. Although the financial markets are generally showing recoveries, since the global financial crisis, the recent uncertainties in the global economy are acting as constraints on them.

---

18. The domestic foreign currency transfer system operated by some commercial banks is used mainly for settlements of foreign currency transfers between domestic companies and individuals and of foreign exchange transactions not settled through the CLS system, but it is not linked with other FMIs including BOK-Wire+.

Chart 6
Trends of Finance-related Development Indicators
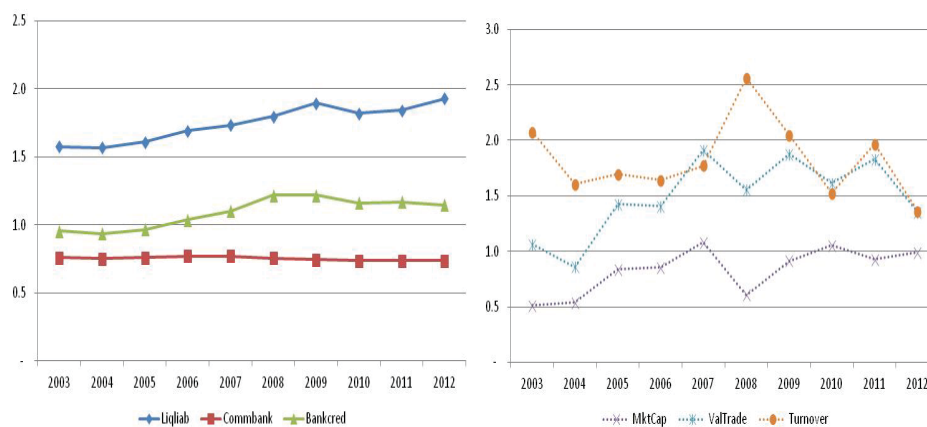
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Liqliab	1.6	1.6	1.6	1.7	1.7	1.8	1.9	1.8	1.8	1.9
Commbank	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7
Bankcred	1.0	0.9	1.0	1.0	1.1	1.2	1.2	1.2	1.2	1.1
MktCap	0.5	0.5	0.8	0.9	1.1	0.6	0.9	1.1	0.9	1.0
ValTrade	1.1	0.9	1.4	1.4	1.9	1.6	1.9	1.6	1.8	1.4
Turnover	2.1	1.6	1.7	1.6	1.8	2.6	2.1	1.5	2.0	1.4

Note: 1) Liqliab: Lf (Liquidity of Financial Institutions) / Nominal GDP.
Commbank: Total assets of commercial banks / Sum of commercial bank and central bank assets.
Bankcred: Total credit of deposit-taking banks to private sector / Nominal GDP.
MktCap: Total value of stocks (KOSPI and KOSDAQ) / Nominal GDP.
ValTrade: Total value of stocks being traded / Nominal GDP.
Turnover: Total value of stocks being traded / Total value of stocks.
Sources: BOK, KRX, KSD.

4. Analysis

4.1 Event Analysis

4.1.1 Financial Markets of Korea in 2008

The Korean financial markets experienced wide fluctuations in 2008, owing to the global financial crisis and to the resultant outflows of foreign investment funds. Impacted by the net outflows of foreign stock investment funds and by a deficit in the current account, the US$/KRW exchange rate rose to 1,513 won per dollar on Nov. 24, its highest level since March 1998. It subsequently shifted to a downward trend, influenced by a large-scale current account surplus, by announcement of the currency swap agreement with the U.S. Federal Reserve, and by the authorities' efforts to stabilise the foreign exchange market. Meanwhile, with the surge in oil prices followed by the collapse of Lehman Brothers, the KOSPI fell sharply to its low for the year of 938.8 on October 24. It subsequently pulled out of its steep downward trend, owing to major countries' announcements of market stabilisation and economic stimulation measures along with the moderation of foreigners' net selling.

Chart 7

Korean Won Exchange Rate   Market Interest Rates and Stock Prices
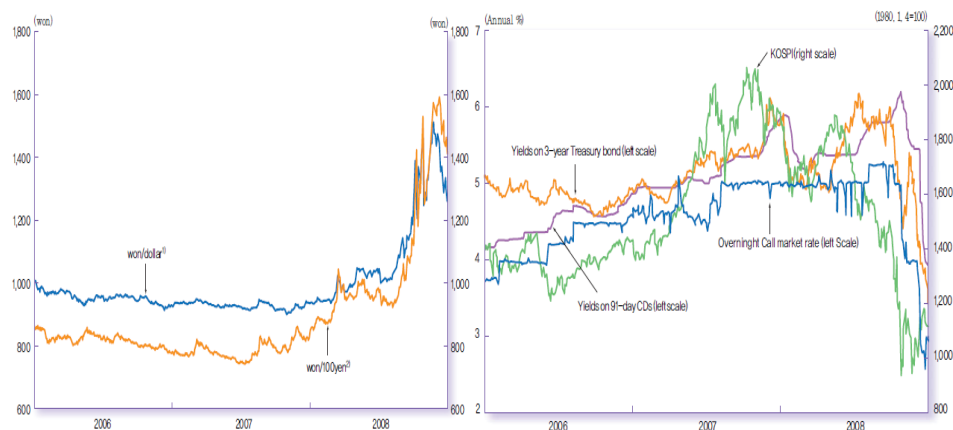
Notes: 1) Closing rate basis.   Source: BOK.
          2) Arbitrated rate of exchange
          announced by Seoul Money
          Brokerage Services, Ltd.
Source: BOK.

113

4.1.2 Pre- and Post-Crisis FMI Operation and Settlement Trends[19]

At the time of Lehman Brothers' collapse in September 2008, central banks around the world were concerned about the possibility of the event having a significant impact not only on the global financial market but also on the PSSs. At around the time of Lehman Brothers' filing for bankruptcy, central banks in the CLS settlement currency countries including the BOK, exchanged information about the impacts on the CLS system and on FMIs in the major countries, in many rounds of conference calls. As a result, although there were some delays in the settlement of securities transactions in some countries, the CLS systems and FMIs in most countries were found to have operated without problems.

In Korea, thanks to the trouble-free operation of the FMIs, there was no instance of obvious turmoil. The BOK limited the use of BOK-Wire+ by Lehman Brothers' Seoul branches (Lehman Brothers Bank House and International Securities in Seoul) immediately after the suspension of their businesses by the FSC on September 16, 2008. For transactions already made, it allowed settlement through BOK-Wire+, thus preventing any disturbances to the FMIs. There were some securities settlement delays on the date of the business suspension, but settlements of all transaction contracts made before the suspension were completed successfully, as the BOK extended the operating hours of BOK-Wire+ in close cooperation with the relevant FMIs including the KRX and KSD and the other financial supervisory authorities.

Compared to the time of the global financial crisis, FMIs' interconnectedness has now increased significantly, mainly due to the sharp growth in money market settlement driven by a dramatic increase in Repo transactions.

_____

19. Along with the statistics on the systems that the BOK designated as systemically important systems corresponding to the FMIs under the PFMIs, we include the statistics on the other systems linked with BOK-Wire+ for broad analysis. Refer to Appendix 3 for more detailed statistics.

Chart 8
Comparison of Pre- and Post-Crisis[1] Scales of Interconnectedness
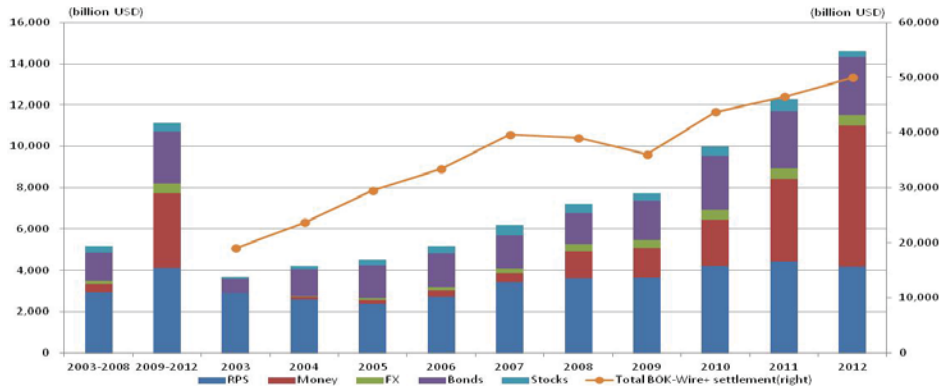
Note: 1) Value of settlement between each FMI and BOK-Wire+.
Sources: BOK, KRX, KSD.

Although the Korean financial market has shown a somewhat unstable pattern of movements in the last couple of years or so, affected by overseas factors causing financial instability, including the global financial crisis, the recent euro area fiscal crisis, and the mounting concerns about a slowdown of the world economy, the FMIs have operated without serious problems. Interconnectedness has continued to rise from month to month.

Chart 9
Recent Values of Monthly Settlement between Market FMIs and BOK-Wire+
(2010.1~2012.12)

Sources: BOK, KRX, KSD.

115
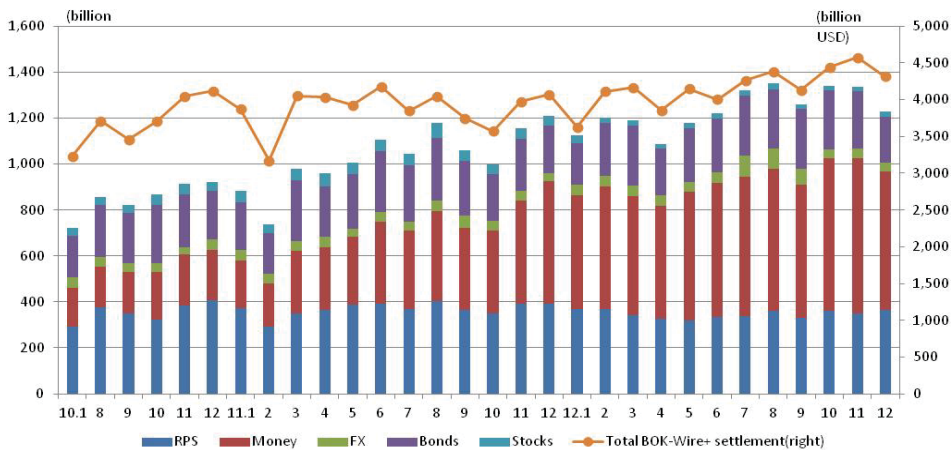
However, increased concerns about mutual savings banks have acted to increase the risks to the RPSs, as 16 mutual savings banks suffered business suspensions in 2011 due to problems associated with troubled real estate PF loans. In January, and in February and September of that year, when the business operations of several mutual savings banks were suspended simultaneously, the maximum rate of utilisation of the Korea Federation of Savings Banks (KFSB)'s net debit cap[20] increased sharply, rising to 100% on January 17 when the processing of customer fund transfers was halted briefly as a result.[21] Savings banks, however, participate in the RPSs indirectly through the KFSB and their settlement amount is quite small, and so their impacts on the FMIs have been slight.

4.2 Bivariate Correlation Analysis

Bivariate correlation analysis using annual data[22] has the problem of the length of the time series being too short, and so for this section we did an analysis with quarterly data (from 2003 to 2012). Analysis of the bivariate correlations between the PS (BOK-Wire+)-to-GDP ratio and the financial development indicators showed the coefficients of correlation of Liqliab, Bankcred and Commbank to be statistically significant at levels of significance of 5% and 1%. Bivariate analysis of PS-to-GDP and the stock market development indicators found the coefficient of correlation of MktCap to be statistically significant at

_____

20. A net debit cap is a ceiling on net debits (accumulated amounts of payment instructions transmitted to other banks - accumulated amounts of payment instructions received from other banks) that can be incurred by participants in the RPSs. In some net settlement systems, unsettled liabilities between participants occur as payment instructions between them are transmitted and received in real time through computer networks and the amounts are deposited in their customers' accounts prior to final settlement via BOK-Wire+ the following day. To reduce the possibility of occurrence of settlement failure and the total amount associated with this possibility, a measure has been taken to deter excessive increases in unsettled net liabilities by having participants set ceilings, i.e. net debit caps, on their unsettled net liabilities in the transactions concerned.

21. If the amount of net debit of a participant exceeds its self-designated net debit cap during the day, this may cause delay or stoppage of that participant's customers' payment instruction to other participants, thus impairing stability and reliability of the RPSs.

22. **Results of Bivariate Correlation Analysis Using Annual Data**

	Liqliab	Commbank	Bankcred	MktCap	ValTrade	Turnover	EI(goods)	EI(goods+services)
Coefficients of correlation	0.95798	-0.65543	0.92599	0.64232	0.66938	0.01313	0.91321	0.93037
Z values	5.08183	2.07626	4.31129	2.01638	2.14203	0.03475	4.09169	4.39502

116

the 5% significance level, while the coefficients of correlation of ValTrade and Turnover were not significant. The coefficients of correlation between PS-to-GDP and the external integration indicators (EI (goods) and EI (goods + services)) were statistically significant at significance levels of 5% and 1%. The above results may imply the close relationship between the PS and other economic indicators.

Table 8
Results of Bivariate Correlation Analysis Using Quarterly Data

	Liqliab	Commbank	Bankcred	MktCap	ValTrade	Turnover	EI goods)	EI(goods+services)
Coefficients of correlation	0.83743	-0.76818	0.78636	0.70088	0.42054	-0.30096	0.84529	0.84352
Z values	3.20795	2.68777	2.80931	2.29923	1.18621	0.82170	3.27920	3.26283

However, there is also a possibility that the results may have been driven by spurious relationships because the time series used in the analysis may be nonstationary with upward trends. For this reason, ADF tests were thus conducted to check whether the indicators have unit roots, and the results showed that almost all indicators do. Bivariate correlation analysis was conducted again, this time using the first log differences of each indicator. The results showed that the coefficients of correlation between PS-to-GDP and all other economic indicators were not significant. We did cointegration tests (Johansen cointergarion test) between PS-to-GDP and each indicator, and found that only Liqliab, Turnover, EI (goods) and EI (goods + services) were cointegrated with PS-to-GDP.

Table 9
ADF Test Results Using Quarterly Data

	Unit root (none)	Unit root (intercept)	Unit root (intercept + trend)
Liqliab	O	O	X
Commbank	O	O	O
Bankcred	O	O	O
MktCap	O	O	O
ValTrade	O	O	O
Turnover	O	O	O
EI (goods)	O	O	O
EI (goods+services)	O	O	O

Note: 1) O indicates that the null (Ho) cannot be rejected at 5% significance level, and X indicates that the null (Ho) can be rejected at 5% significance level.

Table 10

Results of Bivariate Correlation Analysis Using Log Differentiation

	Liqliab	Commbank	Bankcred	MktCap	ValTrade	Turnover	EI (goods)	EI (goods+ services)
Coefficients of correlation	0.26504	-0.14593	0.22574	0.32413	0.44343	0.29581	0.27165	0.25454
Z values	0.71838	0.38886	0.60771	0.88966	1.26067	0.80676	0.73723	0.68857

4.3 FMI Oversight and Supervisory Framework

The FMIs of Korea are regulated, supervised and overseen by the central bank, market regulators, and other relevant authorities. Based upon the FISCM Act, the Banking Act and other related laws, as was shown in Sub-section 2.4 - FMI Oversight and Supervisory Authorities, the FSC regulates the FMI operators, such as the KRX and KSD, and the payment service providers. The BOK is meanwhile in charge of the oversight of the PSSs operating in Korea. In accordance with the BOK Act, the BOK oversees all of the FMIs operated by other institutions, including the RPSs, the CCP, the CSD, and the CLS system. Meanwhile, pursuant to the BOK Act, the BOK may require institutions operating PSSs to provide it with materials related to payment and settlement, and if necessary request such institutions or the supervisory bodies responsible for them to take measures for improvement of their operating rules, etc.

5. Conclusion and Recommendations

The FMIs are evaluated as having contributed to preventing the collapse of the financial system during the global financial crisis. However, we must prepare against the possible spread of systemic risk in a future crisis situation due to the interdependency among FMIs. The use of DvP and PvP methods has reduced credit risk, but it has increased the interdependency among the FMIs, which has been further heightened by the settlement activities of the financial institutions that participate in a number of FMIs. In the case of Korea, the FMIs are connected to each other clustered around BOK Wire+, and major financial institutions participate in multiple FMIs at the same time. They show a high level of interdependency as a whole, and so the BOK conducts oversight of the FMIs by monitoring, regular assessment and making recommendations.

However, in order to prevent the spread of systemic risk, we need to analyse more thoroughly these interdependencies and review the related arrangements. It is important to collect sufficient information on the FMI participants. For this, we need to strengthen the monitoring of the liquidity and settlement situations

of major PSS participants. We may also consider carrying out joint emergency response drills to manage the operational risks of FMIs, and having joint discussions among the operators concerning their Business Continuity Plans (BCPs). In addition, the related authorities need not only to engage in regular exchanges of information and discussions on major pending issues, but also to prepare ahead of time a more clearly defined system of cooperation for swift decision-making in emergency situations.

References

Bank of Korea, (2009), Analysis of Interdependency Across Payment and Settlement Systems, February (in Korean).

Bank of Korea, (2010), Payment Systems in Korea, August.

Bank of Korea, (2009), Annual Report 2008, June 2009.

Bank of Korea, Payment and Settlement Systems, Annual Report 2008~2012.

Committee on Payment and Settlement Systems, (2001), A Glossary of Terms Used in Payment and Settlement Systems, January.

Committee on Payment and Settlement Systems, (2003), The Role of Central Bank Money in Payment Systems, August.

Committee on Payment and Settlement Systems, (2005), Central Bank Oversight of Payment and Settlement Systems, May.

Committee on Payment and Settlement Systems, (2008), The Interdependencies of Payment and Settlement Systems, June.

Committee on Payment and Settlement Systems, (2011), Payment, Clearing and Settlement Systems in the CPSS Countries, September.

Committee on Payment and Settlement Systems, (2013), Statistics on Payment, Clearing and Settlement Systems in the CPSS Countries, January.

Committee on Payment and Settlement Systems - International Organisation of Securities Commission (CPSS-IOSCO), (2012), Principles for Financial Market Infrastructures, April.

CPSS-IOSCO, (2012), Disclosure Framework and Assessment Methodology, December.

European Central Bank (ECB), (2010), The Payment System, September.

Joong Shik Lee, (2012), "The Roles and Tasks of FMIs in Reducing Systemic Risk," Conference on Payment and Settlement Systems, Bank of Korea, July 2012 (in Korean).

Leinonen, Harry, (2008), "Payment Habits and Trends in the Changing E-landscape 2010+," Euro System.

List of Abbreviations

BCP	Business Continuity Plan
BOK	Bank of Korea
CSD	Central Securities Depository
CCP	Central Counterparty
CPSS	Committee on Payment and Settlement Systems
DvP	Delivery versus Payment
FISCM Act	Financial Investment Services and Capital Markets Act
FMIs	Financial Market Infrastructures
FSC	Financial Services Commission
FSS	Financial Supervisory Service
KFTC	Korea Financial Telecommunications and Clearings Institute
KOSPI	Korea Composite Stock Price Index
KOSDAQ	Korean Securities Dealers Automated Quotations
KSD	Korea Securities Depository
KRX	Korea Exchange
LVPS	Large Value Payment System
MPC	Monetary Policy Committee
PFMIs	Principles for Financial Market Infrastructures
PvP	Payment versus Payment
RPS	Retail Payment System
SIPSs	Systemically Important Payment and Settlement Systems
SSS	Securities Settlement System
TR	Trade Repository

Key Economic Indicators and Statistics of Payment Systems in Korea

(Total for the Year)

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
KOSPI[1]	680	833	1,074	1,352	1,712	1,529	1,429	1,765	1,983	1,930
G D P (US$ billion)[2]	644	722	845	951	1,049	931	834	1,015	1,115	1,129
G D P growth (%)[3]	2.8	4.6	4.0	5.2	5.1	2.3	0.3	6.3	3.7	2.0
Unemployment rate (%)	3.6	3.7	3.7	3.5	3.2	3.2	3.6	3.7	3.4	3.2
Consumer prices (%)[4]	3.5	3.6	2.8	2.2	2.5	4.7	2.8	3.0	4.0	2.2
External Integration[5]	0.7	0.8	0.8	0.8	0.9	1.1	1.0	1.1	1.1	1.1
PST[6]/ GDP	41.5	42.2	44.8	46.0	49.7	55.1	57.1	57.2	56.0	58.0
PS(BOK-Wire+)/ GDP	29.5	32.6	34.9	35.1	37.8	41.9	43.2	43.1	41.7	44.3

Notes: 1) Period-average.
2) Converted to US$ based on yearly average USD/ KRW exchange rates.
3) Rates of increase compared with the previous periods.
4) Rates of increase compared with the same periods of the previous years.
5) (X of goods and services + M of goods and services)/GDP.
6) Payments processed by select interbank funds transfer systems (BOK-Wire+, Check Clearing System, Interbank Shared Networks).

Source : BOK, Korean Statistical Information Service.

BOL-Wire+ Participants Using Other FMIs[1]

(End of the Year)

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Retail Payments (Net Settlement)	26	26	26	25	23	23	51	53	53	55
(Direct Participants)	21	21	21	21	21	22	23	23	23	24
(Indirect Participants)	0	0	0	0	0	0	27	29	29	30
Money Market[2] (Direct)	112	108	107	107	109	114	115	115	120	119
FX Market[3]	0	4	18	20	22	23	28	33	36	36
(Direct Participants)	0	4	6	8	9	10	14	19	22	22
(Indirect Participants)	0	0	12	12	13	13	14	14	14	14
Bond Market[4] (Direct)	112	108	107	107	109	114	115	115	120	119
Stock Market[5]	73	71	68	67	68	74	74	74	75	75
(Direct Participants)	73	71	42	42	43	49	49	49	50	48
(Indirect Participants)	26	26	26	25	25	25	25	25	25	27
No. of BOK-Wire+ Participants	128	123	123	122	122	129	129	128	133	132
No. of Participant in Multiple Markets										
RPS and Money	51	51	51	51	51	52	52	52	52	53
RPS, Money and FX	23	23	23	23	23	23	23	23	23	23
RPS, Money, FX, Bond and Stock	18	18	18	18	18	18	18	18	18	18

Notes:　1) Based on the current statuses of participants in each FMI as of end-2012; past participants in each FMI and their participation in multiple FMIs, by year, estimated by reflecting the changes in BOK-Wire+ participants each year.
2) CDs, CP, Repos (OTC markets); call transaction settlements not included, as they are settled within BOK-Wire+ and not on a separate system.
3) Foreign exchange payments through CLS System.
4) Based on OTC markets.
5) Based on KOSPI and KOSDAQ market participants.
Sources:　BOK, KRX, KSD.

Key Economic Indicators and Statistics of Payment Systems in Korea

(Total for the Year)

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2003~ 2008[9]	2009~ 2012[9]
No. of Total Payments[2]	1,592	1,724	1,987	2,804	2,254	2,541	2,752	3,300	3,623	3,303	2,030	3,245
Value of Payments[2] Total	18,973	23,649	29,450	33,416	39,633	39,023	36,020	43,730	46,471	49,967	30,691	44,047
Retail payments (net settlement)	2,890	2,583	2,364	2,723	3,400	3,598	3,641	4,210	4,416	4,163	2,926	4,107
(Direct)	2,890	2,583	2,364	2,723	3,400	3,598	3,601	4,064	4,254	4,041	2,926	3,990
(Indirect[3])	-	-	-	-	-	-	40	146	161	122	-	117
Money Market[4](Direct)	-	132	192	307	462	1,325	1,415	2,233	4,010	6,837	403	3,624
FX Market[5]	-	25	82	158	211	328	387	468	515	518	134	472
Bond Market[6](Direct)	690	1,314	1,616	1,639	1,620	1,523	1,911	2,628	2,760	2,817	1,400	2,529
Stock Market[7][8]	78	156	246	344	486	440	362	438	569	276	292	411

Notes: 1) Settlement value between each market FMI and BOK-Wire+; converted to US$ based on yearly average USD/KRW exchange rates.

2) Total settlements processed by BOK-Wire+.

3) Financial investment companies have participated indirectly since 2009; other indirect participants (five federations of non-bank credit institutions), whose data are not classified, included in the direct participant data.

4) CDs, CP, Repos; 2003 data not obtained; since 2005, the amount settled in exchange-traded repo markets has been included; call transaction settlements not included, as they are settled within BOK-Wire+ and not on a separate system.

5) Foreign exchange settlement through CLS System; settlement data on settlement members that are direct participants and on third parties that are indirect participants not separated.

6) Bonds (OTC markets) and government bonds (exchange-traded market); however, corporate and small-value government bonds (exchange-traded market) are excluded, since they are settled through commercial banks.

7) Institutional Settlement System of Stocks (OTC markets); since 2012, however, the amount settled in the KOSPI and KOSDAQ markets has been included because transactions conducted in these markets have been settled through commercial banks since that time; settlement data on direct and indirect participants not separated.

8) Since 2012, the method for settlement of stock transactions between institutional investors, which used to be based on bilateral netting, has been changed so that securities are now settled on a one-to-one and gross basis while the related funds settlements are done on a multilateral netting basis.

9) Period-averages.

Sources : BOK, KRX, KSD.

Monthly Payments Processed through BOK-Wire+[1]

(Total for Month, Thousand of Transactions, US$ billion)

	No. of Total Payments[2]	Value of Total Payments[2]	Retail payment (Net Settlement)	(Direct)	(Indirect[3])	Money Market[4] (Direct)	FX Market[5]	Bond Market[6] (Direct)	Stock Market[7][8]
2010.1	239	3,233	292	281	11	168	47	179	34
2	230	3,099	297	288	10	147	33	163	23
3	279	3,740	361	349	12	205	36	256	32
4	286	3,960	381	371	11	207	37	261	41
5	252	3,432	348	333	15	158	35	212	37
6	277	3,542	342	329	13	164	44	208	33
7	279	3,693	348	333	15	166	38	197	35
8	280	3,710	378	369	9	176	42	226	33
9	263	3,461	348	337	12	180	40	219	35
10	292	3,706	323	310	13	208	38	252	46
11	304	4,051	385	372	13	220	34	227	48
12	320	4,123	406	392	14	220	46	210	40
2011.1	298	3,871	372	356	16	207	48	207	49
2	237	3,170	291	280	11	191	39	180	36
3	318	4,052	349	339	9	274	42	265	49
4	305	4,034	364	353	11	274	44	218	58
5	288	3,925	386	372	14	295	37	236	51
6	317	4,177	390	377	14	357	45	265	48
7	304	3,847	367	349	18	344	39	245	50
8	319	4,050	405	392	12	388	46	275	63
9	296	3,750	363	356	8	360	53	236	45
10	291	3,572	348	335	13	361	44	202	42
11	318	3,971	392	373	19	447	42	230	43
12	331	4,073	390	374	16	533	36	209	40
2012.1	265	3,630	368	356	11	497	47	178	36
2	271	4,112	367	353	14	535	46	229	25
3	284	4,169	340	329	11	522	44	259	23
4	263	3,856	328	319	9	491	43	204	20
5	276	4,147	321	314	7	557	43	236	22
6	275	4,003	334	323	11	584	46	235	21
7	289	4,263	339	330	9	604	93	262	20
8	283	4,378	362	352	10	617	88	257	27
9	272	4,127	331	321	10	580	68	259	22
10	278	4,440	361	352	9	662	40	255	20

	No. of Total Payments[2]	Value of Total Payments[2]	Retail payment (Net Settlement)	(Direct)	(Indirect[3])	Money Market[4] (Direct)	FX Market[5]	Bond Market[6] (Direct)	Stock Market[7][8]
11	280	4,570	348	338	10	677	43	248	19
12	268	4,315	365	356	10	603	39	198	21

Notes: 1) Value of settlement between each market FMI and BOK-Wire+; converted to US$ based on monthly average USD/ KRW exchange rates.
2) Total settlements processed by BOK-Wire+.
3) Financial investment companies have participated indirectly since August 2009; other indirect participants (five federations of non-bank credit institutions), whose data are not classified, included in the direct participant data.
4) CDs, CP, Repos; call transaction settlements not included, as they are settled within BOK-Wire+ and not on a separate system.
5) Foreign exchange payments through CLS System; settlement data on settlement members that are direct participants and on third parties that are indirect participants not separated.
6) Bonds (OTC markets) and government bonds (exchange-traded market); however, corporate and small-value government bonds (exchange-traded market) are excluded, since they are settled through commercial banks.
7) Institutional Settlement System of Stocks (OTC markets); since January 2012, however, the amount settled in the KOSPI and KOSDAQ markets has been included because transactions conducted in these markets have been settled through commercial banks since that time; settlement data on direct and indirect participants not separated.
8) Since January 2012, the method for settlement of stock transactions between institutional investors, which used to be based on bilateral netting, has been changed so that securities are now settled on a one-to-one and gross basis while the related funds settlements are done on a multilateral netting basis.

Sources: BOK, KRX, KSD.

Chapter 5

AN ANALYTICAL FRAMEWORK IN ASSESSING SYSTEMIC FINANCIAL MARKET INFRASTRUCTURE: NEPAL – FOCUS ON PAYMENT AND SETTLEMENT SYSTEM

By
Hari Gopal Adhikari[1]

1.   Introduction

1.1 Background

Nepal lies between two giant countries, China and India, as a land-locked country. It covers 147,181 sq. km. area and has a population of 26.5 million. Nepal has a small, agrarian economy, with a gross domestic product of US$ 18.96 billion gross in 2012[2], and more than two thirds of its total trade shared with only India, full convertibility in current account but minor convertibility scope in capital account, pegged exchange rate with the Indian Rupee, and free float with U.S. dollar and a few other currencies.

_____

1. Deputy Director, Nepal Rastra Bank, Development Bank Supervision Department, Central Office, Baluwatar, Kathmandu, Nepal. The views expressed herein are the personal views of the author and do not represent the official policy of Nepal Rastra Bank and The SEACEN Centre.

2. Nepal Economic Survey, 2013 (B.S.2070).

Table 1
General Information of Nepal

Particulars	Status
Area	147,181 sq.km
Population	26.5 million.
Geographical Type	Land-locked
Economy- GDP (In US $)	18.96 billion (1 $= 81 Rs)
External Integration- Total Trade (Export + Import)/GDP Total Trade to India/GDP	 88.90 % 56.90 %
Capital Account	Not Full Liberalised (Managed)
Financial Development- Total credit of commercial banks and other deposit-taking banks to the private sector/GDP Average population per BFIs branch	 8,476
Payment System- Total amount of transactions (value) in the payment system/GDP Total no. of transactions (volume) in the payment system/GDP	 NA NA

Nepal suffers from a post-conflict transitional situation especially sociopolitical instability, labour problem, and energy crisis, which plays a significant role to shrink economic growth over the past decade. The economic growth rate is almost sluggish hovering within three percent, at times even dipping into negative, while the inflation rate is always in the periphery of high single-digit.

Low economic growth, high inflation, most of time unfavourable balance of payments, high proportion of consumption in GDP, low rate of saving, low industrial growth due to lack of an investment-friendly environment, i.e., energy crisis, weak labour relationship, security threat, etc., and urban-centered banking system with a large section of the population out of the financial system are some of the challenges facing the Nepalese economy. In this context, the overall business environment signals symptoms of reduced business confidence and weakened investment climate in the economy. Due to these reasons, the various sectors of the economy like agriculture, industry and services are achieving low levels of growth. It seems that the growth of the financial institutions in the financial sector has not yet made a significant impact on the growth of the overall economy. Thus, there is a challenge to channel resources towards productive economic activities for the sustainability of the banking sector and economy as a whole.

The Nepal Living Standard Survey[3] shows 25.2% of the population living below the poverty line. According to the same survey, the Ginni Index, which depicts income inequality, coming down to 0.33, indicating there has been a decline in income inequality.[4]

The Nepalese economy is now largely sustained by remittances of Nepalese workers serving abroad. The political environment is seemingly uncertain in the aftermath of the dissolution of the constitutional assembly, but political instability is expected to subside soon once the elections for the constitutional assembly are held.

1.2 Macroeconomic Situation of Nepal

According to the preliminary estimates, Nepal's economy in FY 2012/13 will grow at 3.6% at basic price against the earlier estimated 5.5%, a rate lower than the previous year. The growth rate in FY 2011/12 at base prices was 4.5% which shows the pattern of uneven growth.

The Consumer Price Index (CPI) based the annual inflation rate that had earlier shown a consistent high trend peaking at 12.6% in the FY 2008/09, has come down in the last three fiscal years in high single digit, but in FY2012/13, it surged again in double digits at 10.6%. The inflation in Nepal is induced by internal and external factors. The internal causes are frequent closures, strikes, load-shedding and political instability that have adversely affected the supply situation, while the external causes are the price hike in petroleum products, impact of Indian inflation attributed mainly to an open border, pegging of Nepal's foreign exchange rate with the Indian currency, and its heavy reliance on trade with India.

Nepal faces a huge challenge in managing its external sector due to the large trade volume almost about two-thirds of its total trade is with India alone, dominance of imports over exports, and large dependence on remittance inflow. Since Nepal's external sector management largely depends on remittance inflow and any untoward event occurring in the international arena will directly affect such inflow. The current account balance, on an average, recorded a surplus in the last decade mainly due to the remittance income. Overall balance of payment is not always consistently favourable.

––––––––––––––––

3. Nepal Living Standard Survey (NLSS) III, made public in FY 2011/12.

4 . The Economic Survey of Nepal, mid-July, 2012.

131

<div align="center">

Table 2
Main Macroeconomic Indicators[5]

</div>

Fiscal Year	08/09	09/10	10/11	11/12	12/13
	Macroeconomic Activities				
Real GDP (Rs. in billion) in producers price	988.3	1,193.8	1,375.0	1,536.0	1,701
Real GDP (annual % change) in Basic Price	3.9	4.3	3.9	4.5	3.6
Saving to GDP	9.4	11.4	14.5	11.5	9.3
	Inflation				
Price (Consumer Price Index)	12.6	9.6	9.6	8.3	10.6
	BOP and Remittance				
Remittances (Rs. in billion)	209.7	231.7	253.6	359.6	430
Remittance Income to GDP (%)	21.2	19.4	18.5	23.1	22.4
Current Account Balance to GDP (%)	4.2	-2.4	-0.9	4.9	1.4
Balance of Payment (Rs. in billion)	44.8	-3.3	2.2	131.6	11.8

1.3 Financial System of Nepal

The Nepalese financial architecture comprises two types of institutions: one is depository institutions which are classified into four categories, namely: 'A' class Commercial Banks (32); 'B' class Development Banks (90); 'C' class Finance Companies (67); 'D' class Micro-finance development banks (25); 16 limited banking-permitted cooperatives; and 34 non-government organisations (NGOs). The second type is non-depository institutions which includes insurance company, Employee Provident Fund, Citizen Investment Trust, merchant banking company and mutual fund company. There are now three estate-owned banks and altogether 274 independent entities and 2,265 of their branches.

Recently, the merger of banks and financial institutions has been given focus for the financial consolidation from the mushrooming situation of financial institutions. Some banks and financial institutions were merged, and some mergers are underway after the introduction of the Merger Bye-Law in 2011.

---

5.   The Economic Survey, mid-July, 2013.

Of these institutions, the commercial banks, development banks, finance companies, micro finance development banks, some of the cooperatives and NGOs are under the regulatory domain of Nepal Rastra Bank (NRB). The non-banking financial institutions which comprise 25 insurance companies, a fully state-owned Employee Provident Fund and Citizen Investment Trust, 14 merchant banking companies, 4 mutual funds, 49 securities brokerage companies, and more than 10,000 saving and credit co-operative institutions spreading all over the country, are outside the central bank domain. There are 25 life and non-life insurance companies, which are regulated and supervised by Insurance Board (IB). The Stock Exchange Board of Nepal (SEBON) regulates the stock exchange, while the other institutions are under the overall regulation of the government. The banking sector is predominant in the Nepalese financial system, especially commercial banks. The ratio of the total banking sector assets to GDP has grown significantly; it reached 78% in 2011, whereas it was 35% in 1990s. Similarly, the ratio of private sector credit to GDP increased from 20% in1994 to 64% in 2011.

Table 3
Financial System of Nepal

BFIs		Regulatory and Supervisory Domain
Types	**Numbers**	
Banks		
'A' Class Commercial Bank	32	Nepal Rastra Bank (NRB)
'B' Class Development Bank	90	
'C' Class Finance Company	67	
'D' Class Micro Finance Development Bank	25	
Limited Banking		
Cooperatives	16	
NGOs	34	
Nonbank Financial Institutions		
Employee Provident Fund	1	Nepal Government
Citizen Investment Trust	1	
Mutual Fund	4	Stock Exchange Board of Nepal (SEBON)
Merchant Banking	14	
Deposit Insurance and Credit Guarantee Corporation	1	Nepal Government
Postal Saving	1	
Cooperatives & NGOs	12,000 (approx.)	
Nepal Stock Exchange Ltd.	1	Stock Exchange Board of Nepal (SEBON)
Insurance Companies	25	Insurance Board (IB)

1.4 Role of Nepal Rastra Bank

The responsibility has been given to the NRB of developing a secure, healthy and efficient system of payment by Nepal Rastra Bank Act 2002, and NRB is trying to implement a strategic approach for advancement of the payment system. The NRB and SEBON have jointly initiated steps to establish a major market infrastructure viz. the Nepal Clearing House Ltd. (NCHL) and Nepal CDS and Clearing Ltd (NCDSCL). The NCHL was established in 2008 under the initiative of the NRB and came into operation through the electronic cheque clearing (Cheque Imaging and Truncation System [CITS]) system in November 2011. It is operational only in the major urban centres, like Kathmandu, Birgunj and Biratnagar. Similarly, NCDSCL was established under the initiative of the Nepal Stock Exchange Ltd (NEPSE) in 2010 as a central depository institution, but has come into operation recently.

There is only one clearing house for large-value payments and for retail payments whose payment goes through bank to bank and settles in the central bank on deferred net settlement (DNS) basis. The government-related payments, including transactions of securities go only through the NRB; stock- and securities-related payments clear through the NCHL and are settled at the settlement bank that is the Bank of Kathmandu Ltd (BKL). The remittance and foreign currency payment transactions are on payment-versus-payment (PvP) basis. All foreign currencies owing by natural persons are required to be surrendered to the NRB besides certain relaxations provided them. Currently, the NCDSCL has been established to serve as a Securities Settlement System (SSS) in Nepal, but is fully operational due to lack of certain regulations. The concept of Central Counterparty (CCP) and Trade Repository (TR) is quite new to Nepal.

1.5 Financial Crisis of 2008 and Impact in Nepal

The financial sector has been significantly liberalised over the past three decades, but it is not much integrated with the global financial market because of its less convertibility in capital account, mostly dependent on India, sharing more than two thirds of total trades. In the context of today's globalised world, threats to financial stability in one economy may spill over to the other economies leading to a global financial crisis. During the global financial crisis of 2008, many developed and developing countries were severely impacted or were panic-shaken, but Nepal had not been directly affected because it has no direct relationship (interconnection or business link to a significant level) with the global

financial market. Nepal was indirectly affected by the crisis through the channel of oan and grant, remittance, tourist inflow, and export to the developed countries.

1.6 Relationship of Systemic Financial Market Infrastructures with Financial Stability

Financial stability is the situation whereby the principal components of the financial system viz. financial institutions, market and infrastructure are performing their functions smoothly and are capable of withstanding various shocks without any disruption in the operation of the financial system. Financial stability has been a main policy concern for central bankers especially after the 2008 financial crisis.

Financial stability is broadly dependent on the saving and investment relation. The gap between the saving and investment may be created from poor functioning of the financial system or from instabilities in this system.

A country's financial system includes its banks, securities markets, pension and mutual funds, insurers, market infrastructures, central bank, as well as regulatory and supervisory authorities, and these institutions help to efficiently channel savings into investment, thereby supporting economic growth. It is now viewed that the financial market is the main vehicle of the economy.

Problems in the financial system not only disrupt payment and settlement but it can also distort the effectiveness of monetary policy and may trigger capital flight and exchange rate pressures, requiring the incurrence of huge costs to rescue the problematic financial institutions, and ultimately worsen economic growth. Moreover, with increasing connectivity among financial institutions and close trade linkages between countries, financial shocks in one area can rapidly spread across the financial sectors and national borders.

"Financial Market Infrastructures (FMIs) are sets of rules, contracts, processes and operational arrangements for managing, reducing and allocating risk arising from transactions between market participants. FMIs play a crucial role in the financial system to facilitate the clearing, settlement and recording of the monetary and other financial transactions. The efficient functioning of financial markets is important in order to maintain and promote financial stability, but poor structure of FMI means that unnecessary exposures arise between market participants."[6]

––––––––––––––

6. CPSS-IOSCO, "Principles for Financial Market Infrastructures," April, 2012.

Moreover, "it is assumed that Systemically Important Financial Institutions (SIFIs) are those whose failure can bring serious negative consequences in economy. But all kinds of financial infrastructures are more or less systemically important to some degree depending up on their capacity, time, locality and environment too. So, it can be considered that an institution, market or instrument in any infrastructure as systemic if it is systemic and its failure or malfunctions cause widespread distress, either as a direct impact or trigger for broader contagion. The size of business volume, interconnectedness and substitutability in the financial system are the main determinants of the systemically important infrastructure."[7]

Macroeconomic stability and sound financial system are prerequisites of economic growth. A well established FMI is required to attain financial as well as macroeconomic stability. Financial stability is the condition where the main financial components, i.e., the financial institutions, markets and infrastructures are performing their functions smoothly in the operation. Financial stability has been a primary concern of policy for central bankers especially in the period of financial trouble.

Financial sector development can spur economic growth whereas financial instability can significantly harm growth and cause major disruptions. This focus also reflects the recognition that close two-way linkages between financial sector soundness and performance, on the one hand, and macroeconomic and real sector developments, on the other hand, need to be considered when designing macroeconomic and financial policies. Thus, financial stability considerations and financial sector development policies are intrinsically interlinked. Moreover, although the development and international integration of financial systems can strengthen access to foreign capital and can promote economic growth, there is a risk of cross-border spillovers of financial system disturbances. Effective surveillance of national financial systems, along with harmonisation and international convergence of key components of financial policies, will help minimise those types of risks. There is interrelationship and interdependence between the FMIs, monetary, fiscal, insurance and securities market related policies adopted by an economy which have direct impacts for the maintenance and promotion of financial stability.

_____

7. The definition is cited from "Guidance to Assess the Systemic Importance of Financial Institutions, Markets and Instruments: Initial Considerations," prepared by IMF, BIS and FSB jointly at 28 October, 2008. All financial market infrastructures may not be equally systemically important at all times. Sometimes one infrastructure is important and somewhere another infrastructure may be important. There is no unanimous definition of 'systemic importance'.

The global financial crisis of 2008 re-emphasised the importance of central banks in crisis forecasting, preparedness and resolution and highlighted the apparent absence of clear, wider mandate and capacity of maintaining stability. Although the NRB, the supervisor and regulator of the financial system of Nepal, does not have a clear policy statement of financial stability in its Act, it has continued its best efforts to maintain financial and monetary stability.

NRB has adopted the following strategies for the financial sector management and stability:

1. Diversify financial sector through prudent and transparent licensing policy.

2. Broaden and deepen financial services including micro-finance services for optimal outreach.

3. Enhance competitiveness in financial sector.

4. Improve legal and regulatory framework compatible with international norms and standards.

5. Consolidate banks and financial institutions.

6. Formulate Financial Sector Master Plan for banking and financial sector.

7. Strengthen proactive supervisory mechanism compatible with international norms and standards focused on risk-based supervision.

8. Facilitate privatisation of public sector banks and financial institutions.

9. Develop the payment and settlement systems in accordance with the international norms and standards.

1.7 Goal and Objectives of the Study

- Discuss an analytical framework to assess systemic FMIs.

- Analyse the systematic and interconnection risk of FMIs in SEACEN and propose the necessary recommendations.

1.8 Importance of the Study

The importance of the study on analytical framework on assessing systemic financial market infrastructures are to:

(i)   Understand the analytical framework;

(ii) Review of existing position of FMIs and related policies and regulations; and

(iii) Identify problems, issues and challenges.

1.9 Scope of the Study

This paper is confined only to the study of the payment and settlement system in the Nepalese financial market.

1.9.1   Limitation

The data of payment and settlement transactions in volume and value are needed to formulate an analytical framework to address interdependence and contagion effects of systemic FMIs within the country and cross-border. However, in respect of Nepal, Nepalese financial market has no robust infrastructure. It has fragmented payment, clearing and settlement systems; most of them are manually operated run on old technology. Transactions by volume and value on daily basis cannot be found in data base or in time series format. Similarly, secondary data also cannot be found due to lack of sufficient research in the area of payment and settlement

2.   Financial Market Infrastructures

2.1 Financial Market Infrastructures in Nepal

FMIs are sets of rules, contracts, processes and operational arrangements for managing, reducing and allocating risk arising from transactions between market participants. FMIs play a crucial role in the financial system to facilitate the clearing, settlement and recording of monetary and other financial transactions. The efficient functioning of financial markets is important in order to maintain and promote financial stability but poor structure of FMI means that unnecessary exposures arise between market participants.'[8]

---

8.   CPSS-IOSCO – Principles for Financial Market Infrastructures, April, 2012.

The financial sector reform programmes in Nepal have been started since 1990's with the adoption of international best practices. The NRB has taken many steps with improved prudential measures and risk management to develop the financial markets. The NRB has two main objectives: (1) Promote financial stability and maintain liquidity required in banking and financial sector; and (2) Develop a safe, secure and efficient system of payment. The NRB has been entrusted with the responsibility of promoting and maintaining financial stability, and has a mandate to ensure safe, secure and efficient payment and settlement system in the country.

As in other developing economies, there is also a large presence of informal financial transactions in Nepal. This sector comprises the local moneylenders and credit and saving associations. This sector is very traditional and poorly developed, limited in reach, and not integrated into the formal financial system. Its accurate size and effect on the entire economy remain unknown. A survey shows that one third of the existing banks are only serving in the capital and 60% of the total business of financial institutions also comes from capital city, while many people from remote areas are out of access to the banking services. The challenge of financial deepening in Nepal is still pressing. The NRB has the responsibility of increasing access to finance with the philosophy of financial inclusion and of enhancing banking habit among the people, simultaneously.

It is acceptable fact that payment and settlement systems should conform to international standards. All the payment and settlement systems operating within the country or trans-border should be safe, secure, smooth and authorised. The robust infrastructures play a lubricating role to undisruptive or smooth payment, clearing and settlement that is ultimately helpful to attain financial stability. With the rapid development in Information and Computer Technology (ICT), method of payment and settlement of transactions have migrated from conventional paper-based instruments to modern electronic payment instruments. Since developing sound, secure, and efficient system is one of the objectives of the NRB, the NRB is making effort in developing and promoting sound and efficient payment system.

The NRB operates only large-value payments and settlement through the clearing house channel on the basis of DNS and SWIFT message is used for inter-bank fund transfer within the country as well as remitting international payment. The NRB also manages the clearing houses in manual mode in the other major cities where the NRB offices are located. With the establishment of the NCHL, Nepal inaugurated the electronic retail payment infrastructure through the Electronic Cheque Clearing (ECC), which centralises the Electronic

Clearing System (ECS) operation and hopefully it will to bring uniformity and efficiency to the system.

The central bank played an instrumental role of a CCP for the settlement of trades in government securities and foreign exchange as the custodian and central securities depository (CSD) for government securities. To facilitate faster settlement of trades in government Treasury Bills that is in scripless form, the NRB has introduced an electronic negotiation-based trading and reporting platform. Further, to enhance the trading infrastructure in the government securities market, the adoption of an ECS is a prerequisite. NRB is in the process of handing over the responsibility of payment and clearing of government securities to the Nepal CDS and NCHL. The Open Market Operations (Repo, Reverse Repo, outright purchase, outright sale) and the Standing Liquidity Facility (SLF), also administered by the NRB, helps to facilitate solvency and give interest rate signals to the Nepalese money markets. Bonds and treasury bills issued by the NRB on behalf of the Nepal government dominate the debt segment of the securities market in Nepal. The physical issuance of government securities is being practiced at present. The institutional investors or people hold their investment in paper-based instruments whereas investment in treasury bills is in scripless format. For other equities, securities, i.e., corporate bonds and debenture, the NEPSE provides the platform for trading in paper-based security instruments. The SEBON is the regulating body for this purpose. There is only one stock exchange in the country. It operates the stock market through the computer by giving order of sale or purchase of share, but the clearing and settlement occurs in the physical format. Traders (Share Broker) independently settle the amount from their respective account holder bank. Settlement takes place on a maximum T+7 basis. Instant DvP system is not now applicable in Nepal for the simultaneous settlement of individual securities transfers and associated funds transfers. From the above facts, it can be surmised that Nepal faces a daunting challenge in the application of ICT, considering the technology is only in a fledgling stage in Nepal. Nepal has no separate payment and settlement rules and regulations to date. E-banking especially through use of ATM Card, Debit Card, Credit Card and mobile phone payment is regulated under the Unified Directive.

2.2 Payment System

A payment system is a set of instruments, institutions, laws, regulations, procedures, funds and other mechanisms needed for a payer to make payment and a payee to receive that payment. An effective payment system should be designed to meet the financial needs of both payer and payee. For example, importers and exporters, this means that the payment system must be capable

of providing for accurate, secure, efficient and affordable international payments. A payment system can be broadly divided into four components: the delivery channels; the payment methods; the clearing; settlement and the funds transfer.

2.2.1 Delivery Channels

Delivery channels are the main interface between banks and their customers. They are contact points, either physical or virtual, from which customers can send payment instructions to the bank. Payment methods are the instruments (or types of instructions) used to make the payment. The traditional payment methods include Cash, Cheque, Pay-order, Draft and Telegraphic Transfer. However, with the introduction of the Internet and e-commerce, the electronic payment has become more popular and widespread all over the world. All payment methods other than payment by cash require settlement by at least two banks, as there is always a debit from one bank account and a corresponding credit by any method in another bank's account. A clearing house is therefore required. The role of the clearing house is to sort the instructions and transmit them to the correct bank and correct account. If international payment is involved, special arrangements are required in order to identify a clearing bank. After the clearing is done, the actual transfers of funds between banks will be settled. In this segment, bank-to-bank payment is made either in real time or on a "net- off" basis generally at the end of the day.

In Nepal, the modern and traditional delivery channels exist side-by-side. Today bank branches and even Automated Teller Machines (ATMs) are commonly regarded as traditional delivery channels. They also have a geographical limit in terms of market reach. However, in developing countries like Nepal where the basic physical infrastructures are not fully developed and labour costs are cheap, the traditional delivery channels still play an important role in facilitating the financial market.

Modern electronic delivery channels include Internet Banking, e-Commerce and other electronic portals, such as electronic fund transfer point-of-sale (EFTPOS) machines, bill payment/presentment and person-to-person payment portals. In Nepal, e-banking (mobile-wallet banking or branchless banking), and Point-of-Sale (POS) machines are the main electronic delivery channels that are growing rapidly offering various payment methods especially in the urban centres. E-Marketplaces are virtual portals that enable buyers and sellers to negotiate their transactions and often include payment services. The provision of e-Payment services is also helpful to e-Commerce activities for such e-Marketplaces. These channels are also useful for those companies that supply

products to overseas, even involving large buyers and domestic retail buyers. E-marketplaces are also gradually growing particularly in Katmandu. Similarly 'remittances' are delivered in cash to their family's hand or remitted to their bank accounts by the branches of BFIs/remittances companies/ personal agents of remittance companies.

2.2.2 Payment Method

2.2.2.1 Cash and Cheques

Cash and cheques are the two main general payment methods in Nepal. Cash has been used in business transactions because it is wholly dependable. However, one of the main limitations of cash is that it requires the transacting parties to be present. Cheques are another payment method used in businesses and are generally acceptable in payment involving local parties as well as in international payment as demand draft particularly in between Nepal and India/ China. However, for international payments, cheques are usually not acceptable as they involve the risk of dishonour by the drawer upon return to the issuing country for clearing. So, neither cash nor cheques are effective methods for international payments. The mode for international payment and settlement for trading is through electronic fund transfer (SWIFT).

In the course of development of the payment system, payments have been made through electronic module. Long before the introduction of the Internet, electronic payment was already available through such payment instructions as telegraphic transfers (TT) and SWIFT messaging. These are proprietary payment instructions initiated by banks through a closed network. Customers, through a delivery channel such as a bank branch, or even a telephone, can instruct their bank to debit their account and remit a specified amount to another account in some other countries through TT or SWIFT. Once the instruction is accepted, the customer's bank debits the account and sends a message through TT or SWIFT to the receiving bank. The final bank-to-bank payment is usually made through the Nostro account in the foreign bank.

2.2.3 Electronic Payment

2.2.3.1 Credit Cards

With a credit card, charges can be paid in full or financed within the credit limit authorised by the card issuer. Credit card payment is not limited to consumers. A corporate equivalent is the purchasing card. These cards allow employees to

purchase small items either in a retail store or on the Internet. The bill will be invoiced monthly to the company for settlement. Unlike the consumer credit card, a company can restrict the type of purchases that may be made with the card. In Nepal, commercial banks are issuing the credit cards, and international Visa and Master cards are popular

2.2.3.2 Debit Cards

Debit cards are cards that are linked to the customers' own bank accounts. When a customer uses the card in the ATM, the amount is debited immediately from his bank account. It is commonly called an ATM card, as it is primarily used at the ATM to withdraw cash. In Nepal, the use of the debit card has extended beyond the ATM. It is also used at retail outlets with EFTPOS terminals. With an EFTPOS terminal, a consumer can make a purchase with a debit card. The amount of the purchase is debited from his account immediately, and the merchant receives the payment the next working day. There are two types of debit card network prevailing in Nepal, i.e., Smart Choice Card (SCT) Network and Nepal Investment Bank Ltd. (NIBL) network. The rest of the banks and financial institutions are associated with these two networks. For the perspective of cross-border uses of cards, the Visa and Master Card can be used. Some of commercial banks are issuing India- and Bhutan-valid card with the accreditation of Indian banks. Nepalese travelers, i.e., merchants, tourists, pilgrims, students, medical patients and workers generally use hard cash in their India tour, but ATM cards users are growing rapidly nowadays.

2.2.3.3 Stored Value Cards (Prepaid Cards)

There are two types of stored-value cards: single purpose stored-value cards (SPSVCs) and multi-purpose stored-value cards (MPSVCs), whereas SPSVCs can only be used to pay for goods and services offered by the issuer (e.g. prepaid phone cards, public utility sectors cards). However, a MPSVC allows cardholders to pay for goods and services offered by other merchants or organisations. A payment service operator usually issues and manages the MPSVC. These kinds of card are not very popular in Nepal because there is a lack of a sophisticated public sector utility provider. The prepaid card for telephone is the only one SPSVCs card that is extensively used in the country.

2.2.3.4 Virtual Debit Cards

A virtual debit card operation is similar to that of a traditional debit card, except that there is no physical card. A transaction is effected through the Internet

or a mobile telephone with a user ID and password for authentication. Customers need to sign up with a service provider to link their virtual debit card to their bank account. These kinds of transactions are growing rapidly but in limited areas only, such as balance enquiry, account debit/credit notification, mobile wallet for utility payments from banks through the SMS.

2.2.4 Electronic Fund Transfer

Fund transfer, a crucial step, is the last step in the overall payment cycle. It is only after the fund is transferred to the beneficiary that the payer is released from any legal liability.The implementation of Electronic Fund Transfer (EFT) system LVPS is yet to be carried out, but retail/utility payments in some limited sectors can be made through electronic fund transfer.

2.2.5 Branchless Banking

Branchless banking covers the basic banking services that are provided to unbanked people through the use of Internet, smart cards, magnetic cards through POS machines, mobile devices through SMS, or mobile banking platforms operated by agents in remote locations In this system, customer are allowed to deposit, withdraw and transfer money to and from their account within established limits fixed by the financial institutions themselves.

2.2.6 Remittance

'Remittance' is an amount transferred from one place to another place. In these days, particularly in the developing countries, the word 'remittance' is understood to mean earnings sent through the formal (banks/money transfer companies) channel by Nepali migrant workers abroad. This kind of retail money is delivered in cash to their families at their doorsteps or credited to their bank accounts by the branches of the BFIs/remittances companies/personal agents of remittance companies. The remittance agencies hand the money to the specified recipient upon verification of the person's identity, i.e., citizenship or sender's code, etc. The money was traditionally transferred through informal channel called 'Hundi'. Some people are still involved in remitting money through Hundi system to and from Nepal.

2.2.7 Clearing

The clearing house processes large volumes of credit and debit transactions. It is usually established as an association with the participating banks as members.

A clearing house performs the important financial functions of clearing and settlement in a fast and secured way. The banks will achieve customer satisfaction due to faster clearing cycle, while enjoying lower operational costs, improved efficiency and lower risks associated with cheque payments. The participating banks send their payment instructions to the clearing house. This is usually done through secure electronic messaging if it has adopted an electronic cheque clearing system. Once the clearing house receives the instructions, it sorts them and sends the data to the receiving banks for processing. The NCHL-ECC System is a national electronic cheque clearing system, which will enables cheques to be cleared on the same day, irrespective of location of the Banks/FIs and their branches.

The NRB and other Banks/Financial Institutions are working together to develop an ECC system to implement an advanced national payment and settlement system. There is a single clearing house, the NCHL, established in 2008 as a separate entity. It is operated electronically but in semi-automatic mode from 2012. The NCHL electronically clears the transactions held within the capital city in the first phase and gradually the service will be extended nationwide. Banks now send their instructions by scanning cheques. It enables cheques to be transmitted electronically and promptly cleared so that the beneficiaries can access their funds with minimum clearing and settlement time of (t+0) at NRB, or maximum of (t+1) irrespective of geographic location of BFIs.

The NCHL introduced the NPR cheque clearing through its NCHL-ECC system on 9th April 2012. It has completed all the pre-requisites required to introduce clearing of NPR-denominated cheques also. The clearing of foreign currency denominated cheques is operational since 3rd February 2012. But not all BFIs are ready in implementing the ECC system. So, the NCHL is rigorously organising briefing programmes for its member BFIs to prepare them to migrate their clearing systems.

2.2.8 Settlement

After the clearing is done, actual transfers of funds between banks will be made on a "net position" basis (which is also called Deferred Net System [DNS]) and sent to the NRB for fund transfer generally at the end of the day. The NRB acts as a settlement bank for all kinds of large value payments and retail payments transacted in the domestic money market. The Express Electronic Cheque Clearing (EECC) System is a special session of short duration for cheque presentment, response from paying bank and NRB settlement. It has 2 hours

of window for presentment to final settlement thus allowing the Banks/FIs and their customers to present and realize their cheques faster. Currently there is only one EECC for four currencies, i.e., NPR, US$, GBP and EUR.

Large-value payments between or among the banks is based on SWIFT (just Message transfer) within the country or beyond the border through the Nostro Account of the correspondent bank.

Settlement will only be completed when the actual funds are transferred between the banks. This is usually done through the banks' accounts with the central bank, or in some cases, a clearing bank. They are typically supervised by the central bank.

Most banking systems in the developed countries now settle on a real-time gross settlement (RTGS) basis rather on a net-off basis. A RTGS system is a settlement system in which processing and settlement take place on an order-by-order basis without netting in real time and continuously.

Nepal is one of the South Asian countries that still follow a manual clearing process. The NRB has been handling the physical clearing of cheques, which requires a long clearing cycle that ranges from a couple of days up to two weeks for outstation cheques. The time-consuming process is a hassle to customers, as they have to wait for long periods of time for transactions to clear.

The EFT system is yet to be implemented for LVPS, but retail/utility payments in some limited sectors can be made through electronic fund transfer.

The implementation of a RTGS system is underway and a separate act for national payment system is also in the drafting stage with the help of International Finance Corporation (IFC) under the Payment System Technical Assistance Project.

2.3 Central Securities Depositories

A CSD provides securities accounts, central safekeeping services, and asset services, which may include the administration of corporate actions and redemptions. A CSD can hold securities either in physical form (but immobilised) or in electronic form existing only as electronic records.

146

The SEBON has granted permission to the NCDSCL to establish a CSD System to enhance the efficiency of the processes involved in the approval, clearing and settlement, and ownership transfer of securities. This company was established in 2010 with the objective of developing the capital market in Nepal by ensuring orderly securities transactions through maintenance of documentation of share and bonds transactions and clearing and settlement of such transactions electronically and to act as a central depository for various instruments, like equity, bond, warrants, etc., and particularly to handle the securities in electronic form. This organisation is entrusted with the safekeeping, deposit, and withdrawal of securities certificates and transfer of ownership/rights of these instruments. For this purpose, the company will establish and operate a modern network for share trading by electronically linking the organised stakeholder member institutions, like share issuance agencies, registrar and transfer representatives, stock exchange and clearing agencies. Such arrangement is expected to bring simplicity and efficiency to the existing trading system. The company has established its office, installed the necessary hardware as infrastructure for starting and managing the depository service, and has also developed a Central Depository Accounting Software (CDAS). Similarly, a separate Clearing and Settlement Software (CnS) is in the final stage of implementation providing services relating to the clearing and settlement of securities traded in the secondary market. This company performs the central depository functions under the regulation of the SEBON.

2.4 Securities Settlement Systems

A SSS enables securities to be transferred and settled by book entry according to a set of predetermined multilateral rules. It is under consideration for the mandate of handling government securities to be given to the NCDSCL. With the adoption of a separate CnS and securing of mandate for both private and government securities management, the SSS will be completely modernised.

2.5 Central Counterparties

A CCP interposes itself between counterparties to contracts traded in one or more financial markets, becoming the buyer to every seller and the seller to every buyer, and thereby ensuring the performance of open contracts.

Currently, there is no specific provision of enacting a CCP status in the centralised way by rule and regulation, but in practice different banks and institutions play this role in different financial market situations.

2.6 Trade Repositories

A TR is an entity that maintains a centralised electronic record/database of transaction data which facilitate the recording, checking and settlement of financial transactions. Like CCPs, there is no specific provision of enacting a TR entity in the centralised way. On the other hand, it is mandatory for every BFI to maintain a record of its banking business transactions.

2.7 Mapping of Financial Market Infrastructures

Nepal is trying to integrate its financial market gradually with the global financial system by diversifying its trade activities and making capital account more convertible. Though, the Nepalese financial market has no robust infrastructure, it has fragmented payment and settlement systems (PSSs) that are inadequately regulated; most of them are manually operated in physical form; the processing are slow and cumbersome for payment, clearing and settlement of business transactions because of low technology adoption. But in recent years, Nepal is making effort to modernise its FMI taking some crucial steps towards adopting ICT.

The financial sector also includes the insurance, money and capital markets. The insurance business has been flourishing encouragingly over the last few years. There are already 25 insurance companies regulated by the IB. The SEBON is the regulator of capital/securities markets. The modern style capital market began only after economic liberalisation in the mid-1980s, increasing private sector investment in the financial sector from 1990s and conversion of the Securities Exchange Center into the NEPSE in 1993.

Table 4
Map of FMIs in Nepal

FMI Types			Instruments	FMIs Operation		
				NRB	NCHL	NEPSE
Money Market	Payment System		Large Value Payment	Interbank Payment through SWIFT Massage	-	-
Foreign exchange Market			Retail Payment	DNS	**CITS**	-
Bond Market	Capital Market Related FMIs	CSD	Government Bond	NRB Itself	-	-
			Equity/Corporate Debt	-	-	**NCDSCL**
Stock Market		SSS	-	-	-	**NCDSCL**
		CCP	-	Government Bond	-	-
		TR	-	Government Bond	-	-

148

The Nepalese financial system has witnessed rapid growth in terms of number of institutions and services introduced over the past three decades since the adoption of the liberalisation policy in 1980s. The institutional network and the volume of operations of the financial system have expanded and diversified. Nepal has 272 depository institutions and 28 contractual saving institutions as of mid-July 2012. However, the modernisation in the areas of payment, clearing and settlement is still rather slow.

2.8 General Policy and Regulatory Framework

The PSS is a mechanism through which financial transactions are smoothly cleared and timely settled. Safe and efficient payment system creates credibility in the financial system, which is one of the prerequisite for maintaining financial stability. With the rapid development in ICT, the method of payment and settling transactions have migrated from conventional paper-based payment instruments to electronic payment instruments. The NRB is playing an important role to develop a sound, secure, and efficient payment system in Nepal as one of its primary objectives under Nepal Rastra Bank Act, 2002. The NRB is making efforts to develop and promote sound and efficient payment system through introducing the RTGS System and validating E-payment. It is expected that the RTGS will soon be implemented.

Similarly, the NRB has granted approval to NCHL to carry out the ECC system. The ECC system provides the means to electronically transfer cheque images through a secure medium, thus completely replacing the traditional physical routine of moving paper-cheques among the banks and clearing house, which result in significant reduction of traditional and time consuming manual process of cheque clearing, both for the banks and for the customers. The NCDCL was established at the initiation of NEPSE to provide centralised depository, clearing and settlement services in Nepal. The operation of CDS is expected to revolutionise the Nepalese capital market. The safety and security of physical holding to electronic medium will eliminate thefts, interceptions and subsequent misuse of certificates while the flow of securities will also be looked due to instant transfers. Hence, the transparency level of trading in this platform is expected to be monitored more securely, clearly and easily.

2.9 Strategic Plan of NRB

The fourth important strategic pillar set by the NRB is its Payment Systems and Mechanism in its Strategic Plan 2012-2016. According to its strategic plan, "Payment and settlement system is a mechanism through which financial

transactions are smoothly cleared and timely settled. Safe and efficient payment systems are fundamental to enhance the efficiency and effectiveness of the financial system. Major tasks to improve the payment system will include (i) implementation of core central banking software (General Ledger), (ii) operationalisation of automated clearing system, and (iii) moving towards RTGS."[9]

The NRB has given high priority in its strategic plan for the Payment Systems & Mechanisms to promote efficient and effective payment system. The NRB has the presumption that quick and secure fund transfer among the financial institutions creates credibility of the financial system. The NRB has put together a five-year plan to introduce the RTGS as the ultimate goal. Payment and settlement systems will be strengthened through introducing the RTGS and validating e-payment. The NRB will undertake a study to modernise the payment and settlement, including the implementation of RTGS, establish institutional mechanism, implement electronic cheque clearing system, make automatic SWIFT transaction by linking swift and ledger accounts interface of the NRB and formulate the Electronic Transfer Act, Regulations for e-payment, electronic fund transfer, Internet banking, credit card operations for efficient and effective payment system.

2.10   Legislative Reforms

The reform process in the areas of payment, clearing and settlement is very slow. However, there is some notable progress achieved in the framework of legislation and regulation.

The following are the major achievements in the FMI sector during the last two decades:

➢ Legislative Reforms
  • The new NRB Act was enacted on January 30, 2002 which provided more autonomy, authority and accountability to the central bank.

  • Banks and Financial Institutions Act, 2006.

  • Securities Transaction Act 2006,

  • The Debt Recovery Act, 2002 helped to establish a debt recovery tribunal (DRT) in 2003.

---

9.   Nepal Rastra Bank Strategic Plan, 2012-2016.

- To enhance the legislative regime, the Public Debt Act, Foreign Exchange Regulation Act, Company Act, Money Laundering Prevention Act, Banking Offence and Punishment Act, Insolvency Act, and Financial Intermediary Act have been promulgated.

- The Central Depository for Securities Deposit Rules, 2010; Central Depository Service Rules, 2011; and Central Depository Service Bye-law, 2012 were issued.

- The Nepal ECC Operating Rules, 2011 and Nepal ECC Rules Book, 2011 (for Cheque payment) were issued.

- Cheque Standards and Specifications, 2012

- Risk Management Guidelines, 2010

- Stress Testing Guidelines, 2012

➢ Regulatory Reforms: The NRB has formulated and issued various prudential regulations as the unified directives since 2002 for implementation in order to ensure a safe, sound and efficient financial system.

➢ As per the NRB Unified Directives, the following directions have been issued in the area of payment system to the bank and financial institutions:

1. Transaction only through Cheques: It shall be mandatory for the licensed banks and financial institutions, in order to assist in achieving the objectives of the Assets (Money) Laundering Prevention Act, 2008, to make the payment of amount of five million rupees or more only through account payee cheque.

2. Fund Transfer through SWIFT Message: The following provisions have been made for carrying out transactions with this Bank by banks and financial institutions through SWIFT Messaging, having installed the SWIFT (Society for Worldwide Interbank Financial Telecommunication) technology: (a) If such transaction is carried out from Sunday to Thursday up to 2:00 pm and request made for fund transfer, fund transfer shall be made on the same day. (b) If the request is made after 2:00 pm, fund transfer shall be made on the next working day. (c) If requested is made within 11:30 am on Friday, fund transfer shall be made on the same day. (d) If requested is made after 11:30 am on Friday, the fund transfer shall be made on the next working day.

3. Electronic Payment: For the purpose of making payment of goods and services purchased through the Internet, mobile, various types cards and other electronic payment, the desiring company may carry out functions relating to payment through electronic payment subject to the prevailing law and following terms and conditions: (a) No transaction in foreign currency shall be allowed; (b) The concerned company shall have to make provisions of all physical infrastructures required for carrying out such functions; (c) Memorandum of Understanding/Articles of Association of the concerned company shall have to clearly mention in its objectives the functions of this nature it intends to carry out; (d) The company carrying out such functions and 'A' class commercial bank or 'B' class development bank of national level have to enter into an agreement or Memorandum of Understanding (MoU); (e) In such agreement or MoU, the payment system and procedure in addition to other provisions have to be clearly mentioned; (f) For this purpose such company shall open a separate non-operative account in the 'A' class commercial bank or 'B' class development bank of national level to which it has agreement with and the amount to be collected from customers has to be deposited in such account; and (g) Except for the purpose of making payment to the concerned beneficiary which has to receive the payment of the goods and services purchased and for the purpose of reconciling the accounts of income/expenditure from the transactions referred to in the agreement, no expenses shall be made from such non-operative account for any other purpose.

2.11 Financial Safety Net Mechanism

The policy provision has been introduced for guaranteeing deposit up to NRs. 200,000 of saving and fixed deposit deposited in the name of natural person of licensed banks and financial institutions with Deposit and Credit Guarantee Corporation (DCGC). Since high dependency on institutional deposits may lead to liquidity problems, a limit has been imposed for institutional deposit collection or resource mobilisation. The A-, B- and C-class licensed institutions may mobilise resources or deposit without any limitation, twenty times of their core capital and fifteen times of their core capital fund, respectively, but they can collect institutional deposits from a single firm, company or any other corporate bodies only up to 20% of their total deposits. A comprehensive Money (Asset) Laundering Prevention Act, 2008 has come into force to combat money laundering and terrorist financing and fulfill the international commitment against money laundering and financing of terrorism. As provisioned by the Act, the Financial Information Unit (FIU) has been established within the NRB to function as a central national agency responsible for receiving, analysing and disseminating

the financial information in order to combat the potential offence of Money Laundering and Financial Terrorism. In order to control financial crimes and fraud, the FIU has issued directives to licensed institutions and accordingly it has started receiving a number of Threshold Transaction Reports (TTRs) and Suspicious Transaction Reports (STRs)

2.12 Stylised Facts of FMIs

The Nepalese financial market constitute basically bank and financial institutions and clearing house under the central bank domain; stock market, merchant banking, CDS and clearing, mutual fund and stock broker under the securities board; insurance under insurance board; non-banking financial institution or fund (provident fund, pension funds, trust) and postal saving bank, saving and credit co-operatives are directly controlled by government. The 209 banks and financial institutions licensed, regulated and supervised by NRB have their 2501 braches, 1499 ATM outlet with 3,581,700 debit cards and 38,700 credit cards distributed all over the country, especially in the urban centres. Similarly, there are 25 life and non-life insurance companies licensed, regulated and supervised by the IB; Employee Provident Fund and Citizen Investment Trust regulated and supervised by the Government of Nepal. The Nepal Stock Exchange is the sole capital market of Nepal with less than 49 broker houses, while the NRB with the help of a few market makers and counterparties BFIs conduct monetary market policy. The advanced financial products and assets, viz financial and commodities futures and derivatives have just been introduced with the establishment of three commodities exchanges, while the market for financial futures has yet to be established. All these indicate that the Nepalese financial market is still in the infancy stage despite its existence for many years; its structure is still not strong or well diversified. There are 15 co-operatives licensed for limited-banking activities, but the co-operatives operating licensed by the Office of Co-operative Registrar is about 15,000.

The ratio of total assets/liabilities of the financial system to GDP at nominal prices increased significantly to 103.01% in mid–July 2009 from 86.30% in mid–July 2008. This ratio was 62.04% in mid–July 2001. The data of financial assets/ liabilities shows that commercial banks alone hold more than 80% of the total assets and liabilities of the financial system.

Table 5
Structure of FMI in Nepal

BFI/Non BFIs	Regulator and Supervisor	Financial Market Infrastructures	Regulator and Supervisor
1. Central Bank Domain		Nepal Clearing House Limited (NCHL)-1 Member BFIs-96; ATM-1471; Credit Card-34802; Debit Card-3123507; EFTPOS Terminal-2500 Mobile Payment company-3	No provision
Nepal Rastra Bank (Central Bank)® 'A' class CBs-31; 'B' class DBs-86; 'C' class FCs-56; 'D' Class MFCs-33 Cooperative+NGOs-50; Clearing House in NRB-5 (branch wise); Nepal Clearing House-1	NRB	Government Bond Market Makers-75	NRB
2. Government		ATM Switching Company-3; SCT, NIBL, NEPS	GON
EPF-1, CIT-1; S&C Co-operatives-12 th+; Postal Saving Bank-1	GON	Nepal Stock Exchange Limited(NEPSE)-1; Stock Broker-49	SEBON
3. SEBON		CDS and Clearing Nepal Limited-1; Member Company-15; Depository Participant-10 Government Bond Market Maker-55	SEBON
Merchant Banking-14; Mutual Fund-4; Nepal Stock Exchange-1; CDS and Clearing-1	SEBON	Credit Rating Agency(ICRA Nepal)-1	GON
1. Insurance Board		Credit Information Centre Limited-1	GON
Life/nonlife Insurance-25	IB		

®Banking and financial Statistics based on mid-July, 2013.

2.13 Regulatory and Supervisory Authority of FMIs

The NRB is the main pivot to FMI. The NRB as the central bank of Nepal is a regulatory and supervisory authority of its domain. It is still playing a crucial role in payment, clearing and settlement. All the banks and financial institutions participate in payment, but the clearing and settlement is performed by the NRB outside the capital city, even today. The NRB has been given its mandate with full power to regulate, inspect and supervise the functions and activities of commercial banks and financial institutions by the Nepal Rastra Bank Act, 2002. The NRB may frame rules and bye-laws on matters which the Bank deems

154

appropriate and may issue the necessary orders, directives and circulars, and it shall be the duty of the concerned commercial banks and financial institutions to abide by such rules, bye-laws, orders, directives and circulars; and the Bank may, at any time, inspect and supervise or cause to inspect and supervise any of the offices of the commercial banks or financial institutions.[10] In the case of the NCHL, the NRB acts as a member of the NCHL for clearing its cheques; acts as a settlement bank; and also as a regulator, but in terms of supervision, there is no clear provision. The NRB is one of the promoters of the NCHL, so the supervision by NRB shows conflict of interest.

Similarly, the SEBON is the regulator and supervisor of capital market infrastructures, i.e., NEPSE, CDS and Clearing Nepal Ltd, Merchant Banking, Dealers and Stock Brokers. The SEBON has been given its mandate to regulate and manage the activities of the securities markets and persons involved in the business of dealing in securities by regulating the issuance, purchase, sale and exchange of securities for the purpose of protecting the interests of investors in securities, by developing the capital market to mobilize the necessary capital for the economic development of the country by law.[11]

Table 6
Regulatory and Supervisory Structure for FMIs

SSN	FMI	Ownership	FMI Type	Authorisation, Designation, or Licensing	Regulation and Supervision
1	Nepal Rastra Bank	State	Settlement	Nepal Government	Central Bank (Autonomous Body)
2.	Bank and Financial Institutions	State/Private	Cheques, Electronic Card, e-banking	Nepal Rastra Bank	Nepal Rastra Bank
3.	Nepal Clearing House Ltd.	State (Nepal Rastra Bank and Government of Nepal)	Electronic Cheque Clearing, Cheque Imaging and Truncation System(CITS), Normal Cheque	Registered in the Company Registrar Office	Regulation by Nepal Rastra Bank but supervision not clear
4.	CDS and Clearing Nepal Ltd	State (Nepal Stock Exchange Ltd)	Paper and SSS	Securities Exchange Board of Nepal (SEBON)	Securities Exchange Board of Nepal (SEBON)
5.	SWIFT	International Organisation	Message carrier	–	–

_____

10. Nepal Rastra Bank Act, 2002, Chapter 9.
11. Securities Act, 2007, Chapter 1, Section 5.

2.14 Mapping Interdependences of FMIs

In Nepal, there is only one form of interdependency that is institutional interdependency. There is no separate system like the RTGS. Each bank and financial institutions makes their retail payment through cash and cheques which clear through the NCHL, and large-value payments are cleared and settled directly in the NRB through SWIFT in their respective accounts. There are basically three payment systems, namely, SWIFT, cheque (common and MICR-encoded) and IPS (interbank payment system-direct payment instruction by letters). In terms of SWIFT services, it is based upon membership basis and there is no mandatory provision for all BFIs to be members of SWIFT.

Table 7
Mapping of Interdependences of FMIs

FMIs			Markets				
			Money Market: T-bill, repo, reverse repo, Call money	**Bond Market: Government bonds**	**Bond Market: Corporate bond/ debenture**	**Forex Market**	**Securities Market: Stock/Equity**
Payment System		SWIFT	×	×	×	× (PvP)	–
		ECC	–	×	×	–	×
		IPS	×	×	×	–	–
Capital Market	CSD	CDS	–	×	×	–	×
		Non-CDS	–	×	×	–	×
	SSS	SSS	–	–	–	–	×
	TR	–	–	–	–	–	–

× denotes Applicable and
– denotes Not-applicable
SWIFT-just carries message of payment instructions.

In Nepal, the money market players - mainly commercial banks are directly dependent on the NRB and government bond market. All the banks and financial institutions are also directly dependent on the NRB, but in the corporate bond market and foreign exchange market, the players are directly dependent on each other and indirectly dependent on the NRB. In the case of securities market payment, it is directly dependent on the commercial banks. There is no alternative for each FMI without interdependencies like NRB, NCHL, NCDSCL. So, the interdependency between and among the financial infrastructures horizontally and vertically is quite high as well as systemically important.

2.15 International Initiatives toward Strengthening FMIs

Various initiatives of the Committee on Payment and Settlement (CPSS) and the Technical Committee of the International Organisation of Securities Commissions (IOSCO) have been the offshoots of the increasing risk and uncertainty in the financial markets, particularly visible during the recent financial crisis. Nevertheless, the need for sound risk management and governance with focus on areas like liquidity and credit risks has been realised by all the stakeholders and this has acted as the driving force behind the initiatives to review the existing standards as a part of crisis proofing exercise. The Principles for Financial Market Infrastructure (PFMI) are part of such initiatives. The PFMI is meant for the FMIs, like Systemically Important Payment Systems (SIPS), CSDs, SSSs, CCPs, and TRs (newly included) which facilitate the recording, checking and settlement of financial transactions. The CPSS and IOSCO have published new PFMI replacing their previous principles and standards viz. (i) Core Principles for Systemically Important Payment Systems (CPSIPS, 2001), (ii) Recommendations for Securities Settlement Systems (RSSS, 2001); and (iii) Recommendations for Central Counterparties (RCCP, 2004).

A comprehensive review of the old sets of standards was launched in February 2010 replacing former three standards with one single, comprehensive set of principles for all FMIs, i.e. CPSIPS, 2001; RSSS, 2001; and RCCP, 2004. The CPSS and the IOSCO issued a consultative draft of the PFMI in March 2011 and conducted extensive market consultation. A final version of the PFMI was published in April 2012, incorporating ideas from the market consultation.

2.16 Objective of Building PFMI

(a) To support the G20 and the Financial Stability Board (FSB), the objective of building PFMI aims at strengthening core financial infrastructures and markets by strengthening the existing standards and broadening their coverage;

(b) Incorporate lessons learned from the 2008 financial crisis to deal with the greater uncertainties and risks in financial markets; and

(c) Promote consistent global enforcement across different FMI types, different FMI designs and different jurisdictions.

24 Principles of Financial Market Infrastructure, 5 Responsibilities of Authorities[12] and Analytical Framework in Assessing Systemic Financial Market Infrastructure[13]

General Organisation
Principle 1: Legal basis
An FMI should have a well-founded, clear, transparent, and enforceable legal basis for each material aspect of its activities in all relevant jurisdictions.

Principle 2: Governance
An FMI should have governance arrangements that are clear and transparent, promote the safety and efficiency of the FMI, and support the stability of the broader financial system, other relevant public interest considerations, and the objectives of relevant stakeholders.

Principle 3: Framework for the Comprehensive Management of Risks
An FMI should have a sound risk-management framework for comprehensively managing legal, credit, liquidity, operational, and other risks.

Credit and Liquidity Risk Management
Principle 4: Credit Risk
An FMI should effectively measure, monitor, and manage its credit exposures to participants and those arising from its payment, clearing, and settlement processes. An FMI should maintain sufficient financial resources to cover its credit exposure to each participant fully with a high degree of confidence. In addition, a CCP that is involved in activities with a more-complex risk profile or that is systemically important in multiple jurisdictions should maintain additional financial resources sufficient to cover a wide range of potential stress scenarios that should include, but not be limited to, the default of the two participants and their affiliates that would potentially cause the largest aggregate credit exposure to the CCP in extreme but plausible market conditions. All other CCPs should maintain additional financial resources sufficient to cover a wide range of potential stress scenarios that should include, but not be limited to, the default of the participant and its affiliates that would potentially cause the largest aggregate credit exposure to the CCP in extreme but plausible market conditions.

_____

12. Principles for Financial Market Infrastructures, published by the Bank for International Settlements, Committee on Payment and Settlement Systems and Technical Committee of the International Organisation of Securities Commissions, April 2012.

13. Guidance to Assess the Systemic Importance of Financial Institutions, Markets and Instruments: Initial Considerations, prepared by the International Monetary Fund, the Bank for International Settlements, and the Financial Stability Board, October 2009.

Principle 5: Collateral
An FMI that requires collateral to manage its or its participants' credit exposure should accept collateral with low credit, liquidity, and market risks. An FMI should also set and enforce appropriately conservative haircuts and concentration limits.

Principle 6: Margin
A CCP should cover its credit exposures to its participants for all products through an effective margin system that is risk-based and regularly reviewed.

Principle 7: Liquidity Risk
An FMI should effectively measure, monitor, and manage its liquidity risk. An FMI should maintain sufficient liquid resources in all relevant currencies to effect same-day and, where appropriate, intraday and multiday settlement of payment obligations with a high degree of confidence under a wide range of potential stress scenarios that should include, but not be limited to, the default of the participant and its affiliates that would generate the largest aggregate liquidity obligation for the FMI in extreme but plausible market conditions.

Settlement
Principle 8: Settlement Finality
An FMI should provide clear and certain final settlement, at a minimum by the end of the value date. Where necessary or preferable, an FMI should provide final settlement intra-day or in real time.

Principle 9: Money Settlements
An FMI should conduct its money settlements in central bank money where practical and available. If central bank money is not used, an FMI should minimise and strictly control the credit and liquidity risk arising from the use of commercial bank money.

Principle 10: Physical Deliveries
An FMI should clearly state its obligations with respect to the delivery of physical instruments or commodities and should identify, monitor, and manage the risks associated with such physical deliveries.

Central Securities Depositories and Exchange-of-Value Settlement Systems
Principle 11: Central Securities Depositories
A CSD should have appropriate rules and procedures to help ensure the integrity of securities issues and minimise and manage the risks associated with the

safekeeping and transfer of securities. A CSD should maintain securities in an immobilised or dematerialised form for their transfer by book entry.

Principle 12: Exchange-of-Value Settlement Systems
If an FMI settles transactions that involve the settlement of two linked obligations (for example, securities or foreign exchange transactions), it should eliminate principal risk by conditioning the final settlement of one obligation upon the final settlement of the other.

Default Management
Principle 13: Participant-default Rules and Procedures
An FMI should have effective and clearly defined rules and procedures to manage a participant default. These rules and procedures should be designed to ensure that the FMI could take timely action to contain losses and liquidity pressures and continue to meet its obligations.

Principle 14: Segregation and Portability

General Business and Operational Risk Management
Principle 15: General Business Risk
An FMI should identify, monitor, and manage its general business risk and hold sufficient liquid net assets funded by equity to cover potential general business losses so that it can continue operations and services as a going concern if those losses materialise. Further, liquid net assets should at all times be sufficient to ensure a recovery or orderly wind-down of critical operations and services.

Principle 16: Custody and Investment Risks
An FMI should safeguard its own and its participants' assets and minimise the risk of loss on and delay in access to these assets. An FMI's investments should be in instruments with minimal credit, market, and liquidity risks.

Principle 17: Operational Risk
An FMI should identify the plausible sources of operational risk, both internal and external, and mitigate their impact through the use of appropriate systems, policies, procedures, and controls. Systems should be designed to ensure a high degree of security and operational reliability and should have adequate, scalable capacity. Business continuity management should aim for timely recovery of operations and fulfillment of the FMI's obligations, including in the event of a wide-scale or major disruption.

Access

Principle 18: Access and Participation Requirements

An FMI should have objective, risk-based, and publicly disclosed criteria for participation, which permit fair and open access.

Principle 19: Tiered Participation Arrangements

An FMI should identify, monitor, and manage the material risks to the FMI arising from tiered participation arrangements.

Principle 20: FMI Links

An FMI that establishes a link with one or more FMIs should identify, monitor, and manage link-related risks.

Efficiency

Principle 21: Efficiency and Effectiveness

An FMI should be efficient and effective in meeting the requirements of its participants and the markets it serves.

Principle 22: Communication Procedures and Standards

An FMI should use, or at a minimum accommodate, relevant internationally accepted communication procedures and standards in order to facilitate efficient payment, clearing, settlement, and recording.

Transparency

Principle 23: Disclosure of Rules, Key Procedures, and Market Data

An FMI should have clear and comprehensive rules and procedures and should provide sufficient information to enable participants to have an accurate understanding of the risks, fees, and other material costs they incur by participating in the FMI. All relevant rules and key procedures should be publicly disclosed.

Principle 24: Disclosure of Market Data by Trade Repositories

A TR should provide timely and accurate data to relevant authorities and the public in line with their respective needs.

5 Responsibilities of Central Banks, Market Regulators, and Other Relevant Authorities for Financial Market Infrastructures

Responsibility A: Regulation, Supervision, and Oversight of FMIs

FMIs should be subject to appropriate and effective regulation, supervision, and oversight by a central bank, market regulator, or other relevant authority.

Responsibility B: Regulatory, Supervisory, and Oversight Powers and Resources
Central banks, market regulators, and other relevant authorities should have the powers and resources to carry out effectively their responsibilities in regulating, supervising, and overseeing FMIs.

Responsibility C: Disclosure of Policies with respect to FMIs
Central banks, market regulators, and other relevant authorities should clearly define and disclose their regulatory, supervisory, and oversight policies with respect to FMIs.

Responsibility D: Application of the Principles for FMIs
Central banks, market regulators, and other relevant authorities should adopt the CPSS-IOSCO Principles for Financial Market Infrastructures and apply them consistently.

Responsibility E: Cooperation with Other Authorities
Central banks, market regulators, and other relevant authorities should cooperate with each other, both domestically and internationally, as appropriate, in promoting the safety and efficiency of FMIs.

Analytical Framework in Assessing Systemic FMI

A FMIs is any person that manages or operates a multilateral system for the purposes of transferring, clearing, or settling payments, securities, or other financial transactions among financial institutions or between financial institutions and that person. FMIs form a critical part of the nation's financial infrastructure and their smooth functioning is integral to the soundness of the financial system and the overall economy. The importance of these utility-like arrangements has been highlighted by the recent period of market stress especially after the financial crisis of 2008. FMIs exist in many financial markets to support and facilitate the transferring, clearing or settlement of financial transactions.

There are three key criteria, **i.e., size, interconnectedness** and **substitutability** helpful to identify the systemic importance of markets and institutions.

Size: The volume of financial services provided by the individual component of the financial system.

Substitutability: The extent to which other components of the system can provide the same services in the event of a failure.

Interconnectedness: Linkages with other components of the system.

Assessment should incorporate **size, interconnectedness,** the **availability of substitutes,** and **concentration** as well as the need to balance **quantitative metrics** with **qualitative judgments** to identify systemically important FMIs, for a more accurate assessment.

3. Financial Statistics

3.1 Financial Market Statistics

3.1.1 Money Market

In Nepal, the money market is dominated by interbank transactions firstly -lending/borrowing between particular commercial banks, and then T-bill, repo, reverse repo and SLF, respectively. The latest scenario of utilisation of inter-bank transactions and SLF slowed down in the fiscal year 2011/12 and caused liquidity situation improvement. Commercial banks carried out inter-bank transactions equivalent to US$ 14.4 million compared to such transactions of US$ 35.0 million in the corresponding period of the previous fiscal year.

Chart 1
Financial Development Indicators
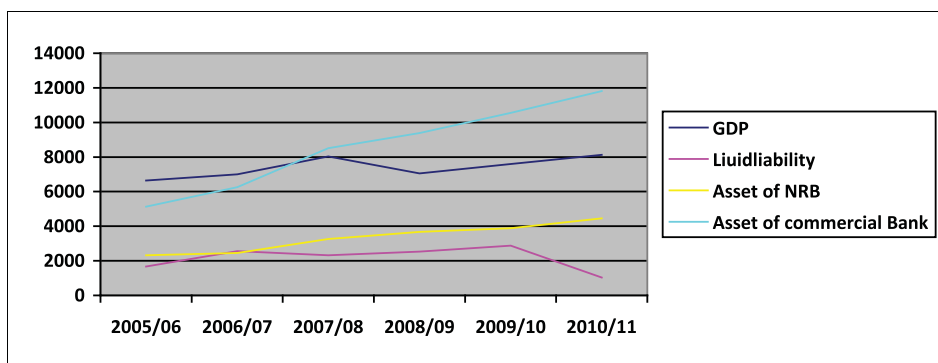
The SLF totaling US$ 0.48 million was used with previous remaining amount. During the same period of the previous fiscal year, these figures were US$ 21.60 million and US$ 0.15 million, respectively. Liquidity absorption has been higher than the liquidity injection due to comfortable liquidity position of the

163

commercial banks. The total liquidity absorbed amounts US$ 0.85 million of which US$ 0.94 million was mopped-up through direct auctions and US$ 8.31 million was injected through repo auction under the open market operations.

Table 8
Financial Related Development Indicators

Year	Financial Development Indicators			Stock Development Indicators		
	Liquid Liability*	Asset**	Credit***	Market Capitalisation®	Value Trading®®	Turnover®®®
2005/06	0.25	0.69	0.51	14.80	0.01	0.17
2006/07	0.37	0.72	0.50	25.60	0.02	0.38
2007/08	0.29	0.72	0.52	44.90	0.04	0.77
2008/09	0.36	0.72	0.81	51.74	0.04	0.35
2009/10	0.38	0.73	0.89	32.15	0.02	0.15
2010/11	0.13	0.73	0.96	19.48	0.01	6.66

*currency plus interest bearing deposit of A ,B, C BFIs/GDP.
**total asset of A class/total asset of A class bank and NRB.
***total credit of BFIs/GDP.
®total value of stock/GDP.
®®total value of stock being traded/GDP.
®®®total value of stock being traded/total value of stock listed.

The money market is driven by liquidity position of the financial market, however, interest rate also a major driving element of money market. The NRB is always careful to maintain stable interest rate through managing liquidity and secondary market (open market operation) facilitation.

3.1.2   Foreign Exchange Market

The Foreign Exchange market is regulated and guided by the NRB pursuant to its authority   defined under the Foreign Exchange Regulation Act. Rules and regulation are issued in order to regulate the foreign exchange market by the NRB. Nepal has adopted a fixed exchange rate regime with Indian currency and an open market exchange rate regime with other foreign currencies.

Table 9
Number of Foreign Currency Transaction

Foreign Currency Transacting Institutions	Mid-July 2012
Commercial Banks	32
Development Banks/Financial Institutions	61
Money Changer, Money Transferors	216
Hotels	100
Travels	1,504
Trekking	1,281
Airlines, Cargo and courier	332
GSA/PSA foreign Airlines and others	119
Total	3,645

The Commercial banks are involved in the transactions of letter of credit, financial derivatives, buying or selling of foreign currencies and remittance activities. They are allowed to open Nostro account in the foreign banks in the concerned countries. There are 3,659 institutions involved in the foreign exchange market in Nepal and they have transacted 3,645 transactions of foreign exchange in mid-July 2012 in a day.

3.1.3 Bond Market

There are basically two issuing practices, that is for government bond and for corporate bond in Nepal. For government bond issuance, the NRB should make a calendar for a year in coordination with the government. Then, the NRB on behalf of the government manages to issue the bond following the calendar. The secondary market of bonds is also managed through market maker as registered in the NRB. However, the works of purchase, sale and ownership transfer of bond are performed in the NRB.

There are saving bond (Citizen Saving Bond, National Saving Bond, Bond for Nepali Worker at abroad) and development bond. The government did not issue any fresh bonds in the first six months of 2012/13, as the full budget was not announced in a timely manner because of political chaos and transition phase for changing the government. In respect of corporate bond, it is rarely issued and, whenever it issued, it takes the form of debenture after getting permission from the NRB and Securities Board.

165

3.1.4 Securities Market

The liberalisation process during the 1990s accelerated the development of the securities market. There are now 49 stockbrokers and securities dealers and 14 issue managers providing securities market intermediation services. The SEBON has approved more than 200 public issues to raise funds. As a result of some reform steps taken and gradual increment in the public participation in the market, the number of listed companies increased from 66 in 1994 to 216 in 2012. At the end of F.Y. 2005/06, market capitalisation as a percentage of GDP was 8.2% while at mid-July 2012, it is 23.41%. The paid-up capital of listed shares went up from US$ 28.3 million to US$ 41.15 million in this period. This shows that the Nepalese capital market is growing significantly, but steadily and still in early stage with respect to its market share in the overall financial system.

Chart 2
Value of Trading and Turnover
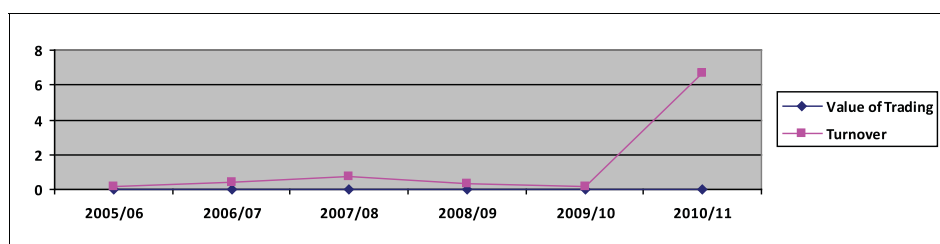
4. Issues and Challenges

4.1 Issues in FMIs

4.1.1 Dilemma of Regulation and Oversight
- Regulation and oversight of non-banking financial institutions, i.e., Employee Provident Fund, Citizen Investment Trust, Merchant Banking and Co-operatives, have not been specifically assigned,
- Supervision of FMIs especially in the case of the NCHL is still in dilemma.

4.1.2 Financial Network
- Secured connection/interlink (Network) between all Participants and General Ledger Interface of the NRB.
- Network between Government Systems and Financial System

4.1.3 Cost and Risk Involvement

- The complexity of trade-off between risks and costs and reduction of cost of liquidity to implement the RTGS.

4.2 Challenges in Payment System

Large-value Payment Systems (LVPSs) that significantly contribute to financial stability is generally taken as systemically important and one of the critical components. These kinds of transactions can be highly potential to trigger financial instability in case of failure in any stage of payment, clearing and settlement. The FMIs have stood the test of time by settling obligations whenever they were due and provided market participants enormous confidence to transact business without the risk of defaults and failures during periods of uncertainty and volatility.

The Retail Payment Systems today is dominated by continuous innovations aided by technology. It has brought immense benefits in terms of new products and delivery channels and at the same time, they have produced concerns for the regulators. Such innovations in the retail payment have created challenges to regulators in the following areas:

(a) **Technological Challenges:** Increased use of technologies like the Internet and mobile phones have resulted in innovative yet complex products and processes; the security issues that often threaten the confidence of users of the technology dominated retail payment system products.

(b) **Payment Assurance and Price Determination Issues:** The entry of non-bank players into the payment field has increased the responsibilities of the regulators for continuous monitoring of their activities as they may pose threat to the payment systems in terms of cost and assurance to the consumers. Likewise, the pricing-related issue of payment services offered by non-banks has become a major concern.

(c) **Gap with International Standard:** Implementing PFMIs in their true spirit in terms of enabling legal provisions, availability of infrastructure, management of risks, and effective oversight of FMIs in Nepal has big gap with international standard.

(d) **RTGS Implementation:** It is a challenging responsibility for the NRB to implement the RTGS in light of the required resources and technological

167

knowhow and insufficient business volume and value according to technological sophistication.

(e) Tackling Fraudulent Activities: To cope or tackle growing IT/cheque-based fraudulent activities, like cash drawn from ATM by stealing pin code of debit card and amount stolen from depositors' accounts from issue of fake 'good for payment' cheques by creating dummy account/firm/company.

(f) Others: Preparing legal infrastructure, establishment of Nepal Financial Network, General Ledger System (GLS) and link with the RTGS.

5. Conclusion and Recommendations

With each financial crisis the emphasis is felt for more efficient and secure financial structure. There is always room big enough for improvement. There is direct or indirect interdependence between the FMIs, monetary, fiscal, insurance and securities market-related policies adopted by an economy which have direct impacts for the maintenance and promotion of financial stability. As like in most countries, the NRB is also responsible for both the systemic stability and the prudential regulation and supervision of banks. Other crucial roles of the NRB in Nepal are monitoring these payment systems, providing emergency liquidity to the markets, managing deposit insurance or providing the safety net or crisis resolution. Important legislative and regulatory reforms have been implemented, banking and insurance supervision and central banking operations have been strengthened, and market infrastructure has improved. The NCHL with the equity participation of bankers, including NRB, in introducing the automated clearing of cheques has added efficiency in the payment system by accelerating the clearing process. However, the progress achieved in bringing together the payment system under unified regulation is slow.

The following suggestions are given policy prescriptions to meet international standards as prescribed by the International Monetary Fund and the Bank for International Settlements in the area of financial market infrastructures. These will hopefully help to establish a secure, healthy and efficient payment system in Nepal.

(a) Should prepare legal infrastructure, i.e., Nepal Payment System Act, Rules and Bye laws, giving topmost priority,

(b) Should establish a dedicated department within the NRB to regulate, monitor and supervise the payment infrastructure with full authority,

(c) Should establish a threshold of payment value or a framework to distinguish systemic important institutions and payment,

(d) Should lay off own stake from the NCHL to eliminate conflict of interest in the supervisory concerns,

(e) Should encourage e-commerce, e-cash, e-governance and develop rules and regulations for smooth operation of payment system in safe, efficient and swift manner,

(f) Should enable multiple intraday liquidity session and multiple settlements in a day for sufficient liquidity in the market to ensure payment and settlement in the same day,

(g) Should be kept in mind, after implementation of RTGS domestically, the next step should be the establishment of Continuous Link System (CLS) for foreign exchange in gross settlement, especially with major trading partners and highest remittance sender countries,

(h) The capacity of the Credit and Deposit Insurance Corporation should be strengthened. Similarly, the deposit insurance programme which began recently should be extended and intensified in the days to come and should also increase the insured deposit amount from Rs 200,000 as of now to Rs 500,000.

(i) In the context of capital market, to strengthen regulatory system and institutional capability of the SEBON, the following steps should be taken:

- Mutualising/Privatising Stock Exchange,

- Further automating and expanding transactions of stock trading system,

- Establishing central depository system (CDS) of securities,

- Professionalising market intermediaries services,

- Integrating government securities trading to the securities market.

- To improve efficiency of stock market through competition, the next stock market should be permitted to establish. The private sector can be considered in this aspect.

References

Bank for International Settlements, (2008), The Interdependencies of Payment and Settlement Systems," Committee on Payment and Settlement Systems, June, Available at: (www.bis.org) and (www.iosco.org).

Bank for International Settlements, (2012), "Principles for Financial Market Infrastructures," Committee on Payment and Settlement Systems and Technical Committee of the International Organisation of Securities Commissions, April, Available at: (www.bis.org) and (www.iosco.org).

Bank for International Settlements, (2005), "Central Bank Oversight of Payment and Settlement Systems," Committee on Payment and Settlement Systems, May, Available at: (www.bis.org).

Government of Nepal, Ministry of Finance, Economic Survey F.Y. 2011/12.

Government of Nepal, Ministry of Finance, Economic Survey, F.Y.2012/13.

Nepal Rastra Bank, Banking and Financial Statistics, Banks & Financial Institution Regulation Department, Statistics Division, Mid-June 2013, Available at: (www.nrb.org.np),

Nepal Rastra Bank, "Strategic Plan, 2012-2016," Corporate Management Department.

Nepal Living Standard Survey (NLSS) III, Made Public in FY 2011/12.

Nepal Rastra Bank, Quarterly Economic Bulletin, Volume 47, Number 3, Research Department Publication Division, Mid-April 2013, Available at: (www.nrb.org.np).

Padmanabhan G., (2013), "Role of Financial Market Infrastructure in Financial System Stability and Implications for Central Bank," 11th SEACEN-World Bank Advanced Course on Payment and Settlement Systems, Kuala Lumpur, Reserve Bank of India, February.

Ramteke, Nilima, (2013), "Application of PFMI- Indian Experience, Principles of Financial Market Infrastructures and Innovations in Retail Payments," Reserve Bank of India, New Delhi, India, February.

Report to the G-20 Finance Ministers and Central Bank Governors, (2009), "Guidance to Assess the Systemic Importance of Financial Institutions, Markets and Instruments: Initial Considerations," International Monetary Fund, Bank for International Settlements and Secretariat of the Financial Stability Board, October.

Schinasi, Garry J., (2004), "Defining Financial Stability," *IMF Working Paper,* WP/04/187, International Monetary Fund, October.

Chapter 6

ANALYTICAL FRAMEWORK IN ASSESSING SYSTEMIC FINANCIAL MARKET INFRASTRUCTURE OF PAPUA NEW GUINEA

By
Wilson E. Jonathan[1]

1. Introduction

Financial Market Infrastructures (FMIs) are critical parts of the financial market that facilitate payment, clearing, settlement and recording of monetary and financial transactions. A smooth and efficient functioning of the FMIs can ensure efficient transmission and implementation of monetary and fiscal policies to foster stability and growth in the financial system and the broader economy. In view of the FMIs' role and the increasing interconnectedness in the financial markets and growing cross-border transactions, there is concern for risks of contagion effects arising from interdependencies between the FMIs (both domestic and cross-border) and global integration. Thus, one system is exposed to adversity arising from the safety and security of another. In this regard, the 2008 global financial crisis (GFC) and other similar crises of the past have underscored important lessons for risk management.

The objective of this paper is to assess the domestic interdependencies of the FMIs in Papua New Guinea (PNG), without attention to cross-border FMIs, as there is limited exposure. Since no single FMI stands out as systemically important at this stage, the study will broadly cover all FMIs, analysing the effects of the 2008 GFC on the FMIs. It will also evaluate the prospects of an analytical framework to assess systemic FMI in PNG and their implications on the domestic financial system.

1.1 General Information on Papua New Guinea

PNG is located north of Australia and South-east of Indonesia, with which it shares a land border. It has 22 provinces, 17 on the mainland and 5 on the

---

1. Manager, Economics Department, Bank of Papua New Guinea.

islands. The country has a population of around 7 million. As it is located in the tropics, PNG has tropical climates of wet and dry.

The economy is generally agriculture based, with around 80% of the population working and living off the land in the rural areas. Thus, agricultural commodities of coffee, tea, rubber, palm oil and copra make up most of the country's exports. However, exports of minerals - gold, copper, oil and now gas are gaining prominence, with first export of liquefied natural gas (LNG) expected in the second half of 2014.

Table 1
Stylised Statistics on PNG

SN	Economy ($ mil.)	Pop (mil.)	Area (sq km.)	GT	KA	EI	FD	PST	PS
	15,530	7	462,840	Island	90% liberalised	0.98	0.26	1.32	-

PNG has experienced continuous growth in the past decade, on average by around 10% between the period 2003 to 2013. As the country depends primarily on commodity exports, the growth during the decade was mainly driven by high international commodity prices and increased domestic demand, which included demand arising from the construction of the PNG LNG project between 2010 and 2013. The exchange rate (kina/US$) closely followed the developments in the foreign reserves.

Inflation was relatively low during the period, recording a yearly average of around 5.0% during the decade, which is considered stable, compared with double-digit inflation in the earlier periods. PNG has fared well relative to other developing countries, which registered average annual inflation of 7.1 % (IMF, 2013) around the same period.

PNG adopted a floating exchange rate regime in October 1994 after the local currency (kina) was floated. Prior to that, a hard currency policy was pursued since independence from Australia in 1975, where the kina was held on par with the US$ by policy, and not by the market. Thus, sufficient foreign exchange reserves were required at all times to sustain the kina exchange rate. Lack of discipline in adherence to the budgeted expenditure in the years prior to 1994 led to a balance of payments crisis, and the Hard Kina Strategy could

no longer be sustained, and hence the kina was floated (Bank of Papua New Guinea, 2007). The central bank often intervenes to ensure there is no large volatility in the exchange rate movement, consistent with its objective of achieving and maintaining price stability, which includes a stable exchange rate.

PNG is an import-dependent country, therefore there is always underlying demand for foreign exchange, in particular US$, to pay for imports. A large portion of any increase in government or private spending spills over into imports (Goodman, et al., 1987). The performance of the kina against the US$ is largely determined by the supply of foreign exchange. This is, in turn, dependent on exogenous factors such as international commodity prices and demand from major trading partner countries. Low production of export commodities domestically can also have a bearing on export receipts and therefore the exchange rate. Good international commodity prices from 2006 to 2012 has seen the kina strengthen against US$, until the latter part of 2012 and into 2013 when prices turned around, driven mainly by low global growth and therefore external demand.

The Central Bank of PNG (BPNG) commenced the process to liberalise the Exchange Controls, including the current account transactions, in July 2003. The approach was to liberalise controls that had less risks and administrative work load, and then consider liberalising other controls at a later date. This meant that the central bank retained some controls on transactions considered risky, and also allowed the market to fully absorb the changes over time.

In line with the above approach, the central bank liberalised all current account transactions in 2005, along with controls on government capital account transactions, flows arising from approved private capital account contracts, and controls on foreign currency accounts with authorised dealers. Other controls were liberalised in 2007, with some remaining, which include Currency Accounts for residents to be held offshore, Gold Export Licensing, and movement of physical cash in access of K20,000.00 (or foreign currency equivalent).

1.2 Performance of FMIs during 2008 Global Financial Crisis

In an overview of the GFC in November 2008, at the G-20 Finance Ministers' Meeting in Sao Paolo, it was accepted that virtually no country, developing or industrial, has escaped the impact of the widening crisis. Countries that have generally been less affected were those with stronger fundamentals and less integration into the global economy (World Bank, 2008). The FMIs in PNG were not adversely affected by the 2008 GFC to the extent of causing market

instability, and affecting the financial system with severe consequences on the macroeconomic variables. The main factor that shielded the FMIs was the local focus and lack of, or limited, integration with global markets.

In this paper, Section 2 will update on the FMIs in PNG, and cover the oversight and supervisory authority of the FMIs. It will also review the interdependencies of the FMIs in the country. In Section 3, the construction of the statistics reflecting the interdependence is shown. It also shows the financial-related development indicators. Section 4 provides the analysis from two perspectives; firstly, from a global shock; and, secondly, a country-specific shock. The FMIs oversight and supervisory framework is also discussed. Finally, Section 5 draws some conclusion and offers the recommendation on developing an analytical framework in assessing systemic FMIs with a regional focus.

2. Financial Market Infrastructures in PNG

The FMIs in PNG come under four categories: Payment Systems (PSs), Central Securities Depositories (CSDs), Securities Settlement Systems (SSSs), Trade Repository (TR), and Central Counterparties (CCPs). There are two main operators of the FMIs in PNG. Given the small size of the financial market, the Bank of PNG performs the roles of the PS, CSD, SSS and TR, while the Port Moresby Stock Exchange (POMSOX) acts as the CCP, dealing particularly in shares.

2.1 General Policy and Regulation Framework of FMIs in PNG

Since the BPNG performs the roles of the FMIs, the Central Banking Act 2000 (CBA, 2000) guides the overall operation of the Bank as well as the FMIs in the Bank. The recent development has been the 'go-live' of the National Payments System (NPS) on 14th October 2014. This followed the enactment of the new National Payments System Act (NPSA), which was necessary in order to make electronic transactions legally binding between banks, as only cheques and warrants are recognised under the existing laws. The NPS entails the Kina Automated Transfer System (KATS) which is the Real Time Gross Settlement (RTGS) system that allows the banks, including the central bank to exchange funds electronically in real time during the business day. Another component of the KATS is the Banking Services System (BSS), which will improve the bank teller service and involves storing signatures and photographs in the BSS for ease of verification, and obtaining balances and statements, by institutions like the Government and the Internal Revenue Commission. These changes are

in the early stage of implementation, but are primed to enhance banking and finance in PNG in a big way.

2.2 Brief Background of FMIs in PNG

Table 2
Stylised Facts of FMIs in PNG

SN	FMI Type		Description
1	Payment System		• **The PS** – The payment and settlement of cheques and warrants is facilitated by the central bank. The new National Payment System (NPS) and the launch of the RTGS in October 2013 will enhance the payment system. At this stage we cannot extract data from RTGS system for trend analysis.
2	Capital Market-related FMIs	CSD	
3		SSS	
4		CCP	
5		TR	• **CSD** – The central bank acts as a CSD, keeping securities accounts, and conducting trade in Government securities. The Government is the only issuer of securities and bonds in the form of Treasury bills and Inscribed stocks. It was set up in 1973 when the central bank was established. CDS operations have been in the form of book entry. The NPS project, recently completed and implemented, will enhance the operations of the CDS.
			• **SSS** – As agent of the Government on issuing Government securities, its role covers the transfers and settlements of securities by book entry, with manual clearing of cheque payments. The NPS will automate and provide to the system.
			• **CCP** – The POMSOX facilitates trade in share capital only, and has not ventured into corporate bonds as yet.
			• **TR** – The central bank also acts as the trade repository and keeps database of transaction on Government securities and bonds.

2.3 Mapping the Interdependency of FMIs in PNG

In PNG, there are no separate entities as operators for the different FMIs, except the POMSOX as CCP. Therefore, the BPNG plays those roles. While

ensuring an effective payment system up until the establishment of KATS (RTGS) in October 2013, it also serves as a clearing house for commercial bank cheque-clearing, and settlement of payments through the Exchange Settlement Accounts (ESAs) that banks maintain at the central bank. As such, there is no interdependency between the entities (and the FMIs), and is less sophisticated.

Table 3
Mapping the Interdependency of FMIs

SN	Markets		Clearing	Settlement
1	Money	Interbank: Among banks Repo: banks/BPNG	BPNG	BPNG via ESA
2	Bond (Govt Inscribed stock)	Only Primary market	Auction at BPNG	BPNG
3	FOREX	Mainly US$/PNG Kina	BPNG	BPNG for domestic transactions. BPNG's corresponding bank in New York for international payments.
4	Securities	Government Treasury bills.	BPNG	BPNG

2.3.1   Interdependency of FMIs in PNG

2.3.1.1   System-based Interdependence

System-based interdependencies occur where the FMIs are directly linked by a financial institution. There are two types: vertical and horizontal interdependencies. The setting up of the RTGS (KATS) may constitute vertical interdependence because it settles transactions of several markets with vertical linkages to the other FMIs (within the central bank), like the CSDs and SSSs, say, for Government security transactions.

Horizontal interdependence entails interdependence between the same system, for instance, two payment systems operating in parallel with each other. This is not the case in the PNG setting, as yet.

2.3.1.2 Institution-based Interdependence

Institution-based interdependencies entail indirect linkage of the FMIs via a common financial institution. As of 14th October 2013, there are four commercial banks that are participants of the RTGS, and will include the Government in due course. Soon all the commercial banks will participate in the BSS under the KATS.

2.3.1.3 Environmental Interdependence

Environmental interdependence involves broader factors which affect FMIs, such as interconnectedness with other networks. Currently, KATS is operating on its own and has no connectivity to the SWIFT or other networks. It may do so in time, as capacity is built up.

2.4 Oversight and Supervisory Authority of FMIs in PNG

The oversight and supervisory authorities of the FMIs in PNG are shown in Table 4. Apart from the POMSOX, all other FMIs come under the guidance of the central bank.

Table 4
Oversight and Supervisory Authority of FMs in PNG

SN	FMI Type	Ownership Public/Private	FMI (name)	Authorisation, Designation, or Licensing	Oversight	Supervision	Onsite Inspection
1	Payment System	public	RTGS (KATS)	**NPSA**	BPNG	BPNG	BPNG
2	CSD	public	BPNG	-	BPNG	BPNG	BPNG
3	SSS	public	BPNG	-	BPNG	BPNG	BPNG
4	CCP	Private	POMSOX		-	-	-
5	TR	public	BPNG	-	BPNG	BPNG	BPNG

3. Financial Statistics in PNG

3.1 FMI Statistics in PNG

The KATS (RTGS) system will emerge as the systematically important FMI in PNG. Since it is a new FMI established in October 2013, we cannot generate data for trend analysis to ascertain the interdependence of the other FMIs to the RTGS system, and other associated risks that it may pose from the interconnectedness.

179

3.1.1 Total Number of Participants in the Payments System

Commercial banks continue to be major players in the Payments System, as direct participants in all the markets. Non-bank financial institutions have grown over time and have become important participants in the bond and securities markets, for the central bank's liquidity management and the Government's budget financing. They go through the banks for their foreign exchange requirements. Table 5 below shows the participants in the payments system, with non-bank financial institutions emerging as key players.

Table 5
Number of Participants in the Payments System in PNG in 2013

Payment System		Multiple Market Participation by PS members			
Total No. of Participants	33	*Money*	*Bond*	*Forex*	*Securities*
Banks	4	x	x	x	x
Bank of PNG	1	x (repo)	x	x	
Nonbank Financial Institutions	28		x		x
Money Market					
Total No. of Participants	5				
Banks	4				
Bank of PNG	1				
Bond Market					
Total No. of Participants	48				
Banks	4				
Bank of PNG	1				
Finance Companies	6				
Microfinance Companies	2				
Savings & Loan Societies	15				
Insurance Companies	15				
Pension Funds	4				
Development Bank	1				
Forex Market					
Total No. of Participants	7				
Banks	4				
Bank of PNG	1				
Finance Companies	2				
Securities Market					
Total No. of Participants	47				
Banks	4				
Finance Companies	6				
Microfinance Companies	2				
Savings & Loan Societies	15				
Insurance Companies	15				
Pension Funds	4				
Development Bank	1				

3.1.2 The PS Annual Market Value of Transactions (in US$) from 2003 – 2013

The transactions in the payment system in PNG are all conducted and settled domestically, and there is no cross-border involvement. Only exception is the Forex market where movement and settlement of international payments by the central bank is concerned. At this stage no one single market stands out as systematically important. The KATS (encompassing RTGS and BSS) will assume this role when in full operation and when capacity is built up, and as it integrates with other systems. At this early stage, the KATS is operating on its own.

As the charts below depict, the annual turnovers in the payment system (money, bond, forex and securities markets) do not indicate any adverse effects or contagion from the 2008 global financial crisis.

Figure 1
Annual Market Turnovers in Different Markets, 2003 to 2013
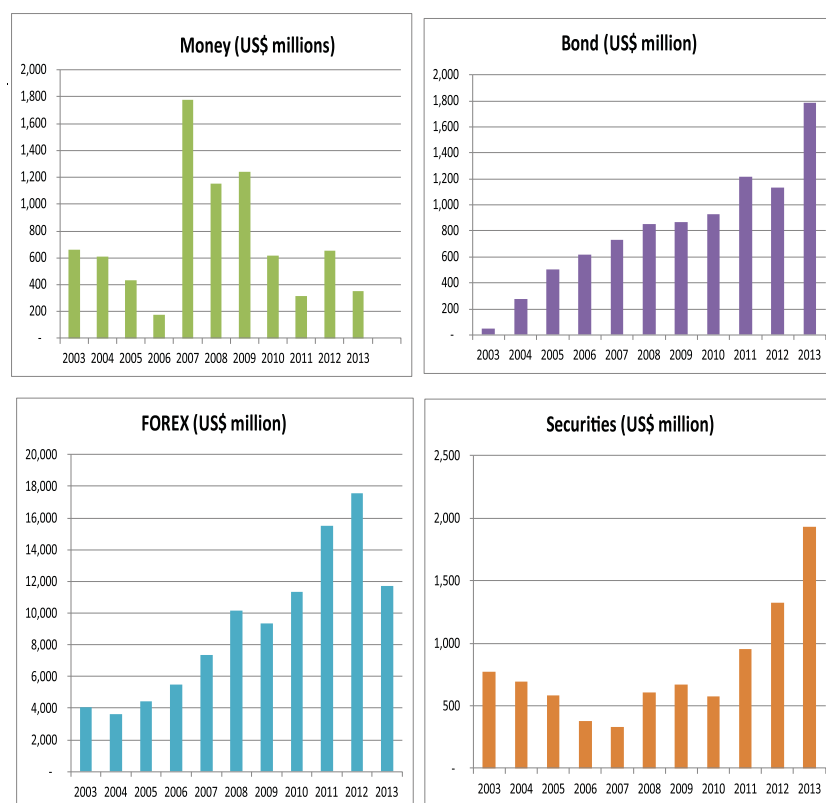
3.1.2.1 Money Market

Only involves interbank borrowing/lending among commercial banks. The Repurchase Agreement (Repo) facility between banks and the Central Bank is hardly used. Participation in the money market is dependent on liquidity requirement of each bank, and the need to maintain daily positive Exchange Settlement Account (ESA) balances, to avoid penalty interest charge. With the RTGS, it is imperative that all banks must be in positive or minimum zero balance on the ESA before the KATS closes for the day.

3.1.2.2 Bond Market

Only captures Government's inscribed stock data, which Government issues as instrument of domestic budget financing, together with Treasury bills. Treasury bills are captured separately under securities market. The increase between the period 2011-2013 reflects high budget deficit and hence the funding requirements.

3.1.2.3 Forex Market

The high turnover between 2009 to the first half of 2012 reflects high foreign exchange receipts from high international commodity prices, and receipts associated with the construction of the PNG LNG project. While international prices fell thereafter, import demand, including that from high Government expenditure, continues to hold up the turnover in the market.

3.1.2.4 Securities Market

Government Treasury bills is the main and frequently used domestic debt instrument to meet weekly cash flow need. Along with the inscribed stock, its use is driven by the Government's budget financing requirements, and short-term cash needs.

3.1.3 The PS Monthly Market Value of Transactions (in US$) from 2010 – 2013

The charts below show the monthly turnovers in the respective markets. Activities in the markets are still underpinned by underlying demand: liquidity needs of banks in the money market, export receipts and import demand in the forex market, and Government's budget financing requirements in the bond and securities markets.

Money (US$ million)

Bond (US$ million)

FOREX (US$ million)

183

Securities (US$ milion)
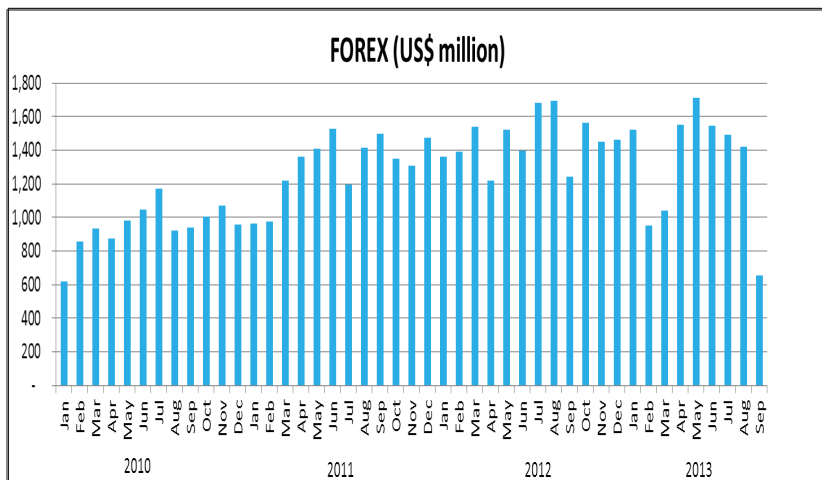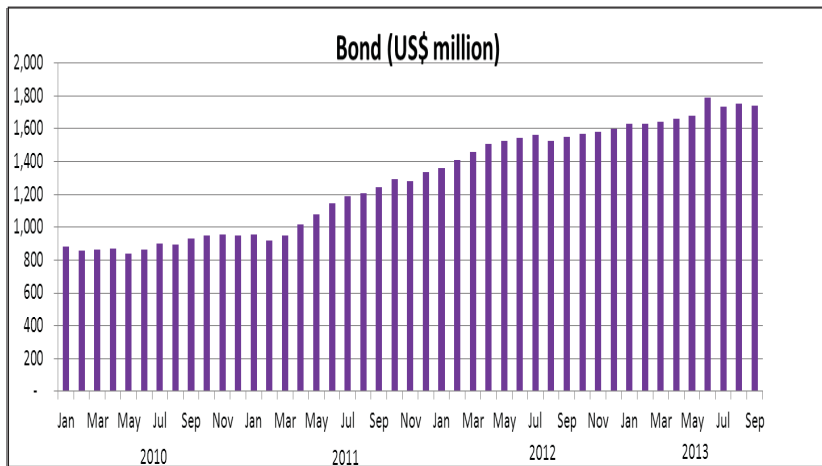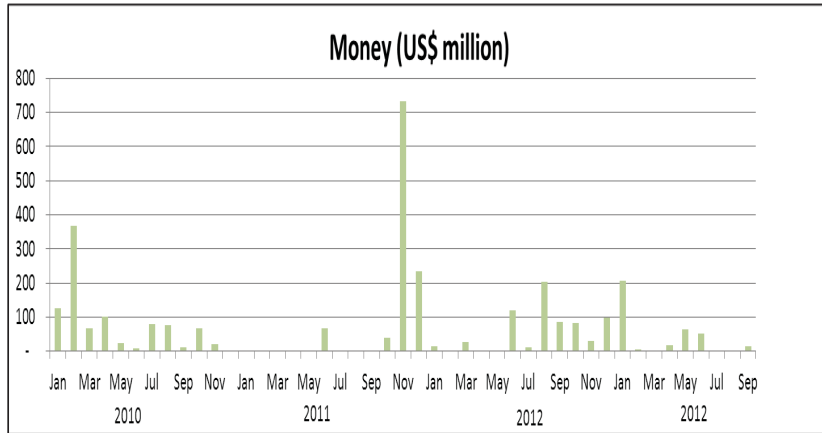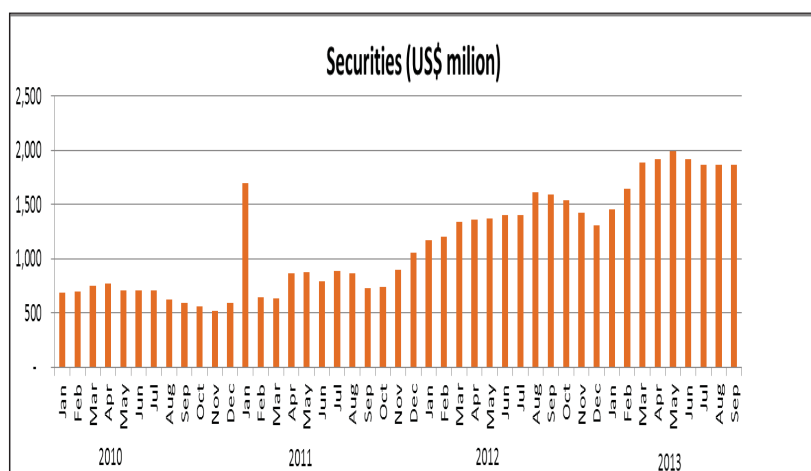
3.2 Statistics Reflecting Interdependencies in FMIs in PNG

Participants in Multiple Market: This shows the presence of PS participants in the multiple markets and reflects how risk and information can possibly be spread through, say, information sharing. As the second part of the Table below shows, there are fewer participants in the more than two markets than there are in two markets. In this case, 77 % of participants in the payment system participate in two markets; the securities and bond markets.

Ratios of indirect linked transactions and cross-border transactions cannot be computed, as the above participants in those respective markets participate directly, and all domestically.

Table   6
Participation in Multiple Markets as at September 2013

	Payment System			
Participants	Money	*Bond*	*Forex*	*Securities*
Banks	4	4	4	4
Bank of PNG	1	1	1	
Finance Companies		6	2	6
Microfinance Companies		2		2
Savings & Loans Societies		15		15
Insurance Companies		15		15
Pension Funds		4		4
Development Bank		1		1
TOTAL NO. OF PARTICIPANTS	**5**	**48**	**7**	**48**

Multiple Market Participation by PS members	
Participants in 2 mkts/total participants	41/48 =0.77
Participants in 3 mkts/total participants	3/48 = 0.06
Participants in 4 mkts/total participants	4/48 = 0.08

3.2 Financial-related Development Indicators in FMIs in PNG

This section covers the key financial indicators for the PNG economy to capture any sign of stress before and after the 2008 GFC. The bivariate analysis in Section 4 assesses with statistical analysis, for such possible developments in those periods.

Table 7
Financial Development Indicators

Year	(1) Liqliab	(2) Commbank	(3) Bankcred
2003	0.03	0.64	0.01
2004	0.29	0.66	0.12
2005	0.34	0.69	0.13
2006	0.43	0.64	0.16
2007	0.51	0.63	0.19
2008	0.50	0.69	0.24
2009	0.59	0.67	0.26
2010	0.55	0.66	0.26
2011	0.57	0.67	0.25
2012	0.57	0.71	0.26
2013	0.56	0.75	0.26

Note: (1) *Liqliab* - The sum total of currency plus demand and interest-bearing liabilities of commercial bank and non-banks divided by nominal GDP; (2) *Commbank* - The total asset of commercial banks divided by sum of commercial bank and central bank assets. (3) *Bankcred* - The ratio of total credit of commercial banks and other deposit-taking banks to the private sector by nominal GDP.

The financial development indicators show an increasing trend over the decade, including the crisis years. The growth in the economy (on average by 10%) during the decade has resulted in the growth in the commercial banks' balance sheets, as indicated by the ratios: *liqliab* and *commbank*. The increase in credit to fund domestic activity is reflected in *bankcred*. However, this ratio is lower than anticipated, as many large firms utilised their own resources or savings to fund capital expenditure or expansion. In addition, between the period 2012 to 2013, the PNG LNG project construction contributed to domestic demand, with contractors sourcing funds from the project itself, and not from the banks.

Table 8
Stock Market Development Indicators

Year	(1) MktCap	(2) ValTrade	(3) Turnover
2003	755.2	4.38	4.91
2004	966.9	4.46	5.25
2005	1,192.5	4.11	4.78
2006	1,361.2	3.80	4.40
2007	1,888.1	4.70	5.96
2008	1,361.1	4.92	7.92
2009	2,239.0	2.53	3.36
2010	3,030.9	4.14	4.55
2011	2,848.3	3.69	5.23
2012	2,755.2	3.43	6.21
2013	2,670.7	3.18	6.84

Note: (1) *MktCap* - Total value of stocks in the domestic market divided by GDP; (2) *ValTrade* - Total Value of stock being traded by GDP; (3) *Turnover* - Total value of stocks being traded divided by the total value of stocks listed in the domestic market; *stock price index*

The stock market indicators show resilience in the local stock market, as investor confidence was still strong during the crisis period, and over the decade. Preference for investment in domestic markets may also be due to exchange rate risks, when repatriating funds back to PNG.

4.   Analysis

4.1 Analysis of 2008 Global Financial Crisis

Since no one FMI stands out as systematically important, we broadly analyse all the FMIs, as they collectively play important role in ensuring financial stability. Overall, the FMIs in PNG continue to perform without noticeable signs of contagion from the global financial crisis. The turnovers from the markets in the payment system and the financial development indicators tend to show strong performance during the decade including the crisis period. All the FMIs have not defaulted on their obligations and have continued to maintain the confidence of the market participants. The resilience in their performance may be attributed limited integration into the global financial markets than owing to strong fundamentals.

4.2 Analysis of a Country Specific Analysis Shock: High Liquidity

The years between 2010 to 2012 have been periods of high liquidity in the banking system, resulting from high foreign exchange inflows and Government spending. This exerted downward pressure on domestic interest rates, thus rendering unattractive investments in domestic money market instruments and deposits. In such situation, investors can consider shifting investment funds abroad, chasing attractive interest rates. However, from the monthly turnover analysis from the markets (Section 3.1.3), we do not see any compelling evidence of capital flight.

4.3 Discussion on FMI Oversight and Supervisory Framework

As mentioned in Section 2.4, the FMI oversight and supervision lies with the BPNG, with the exception of the CCP. The BPNG, as the regulator and supervisor of the financial system, uses the Central Banking Act and other enabling legislation to perform oversight and supervisory roles on the FMIs. Thus, the oversight and supervision in PNG is not fragmented.

As the economy is growing, and with the increase in economic activity and transaction in the financial markets, there is scope for increased interconnectedness among the FMIs. There is no foreign investments in the domestic financial markets, thus, cross-border issues may not be of concern at this stage.

4.4 Bivariate Correlation Analysis

A bivariate correlation analysis is done on the financial market and stock market development indicators.

Table 9
Bivariate Correlation Analysis if PS/GDP with FDIs and SMDIs

Financial Development Indicators	Correlation with PS/GDP = r	1 + r	1 - r	ln(1+r/1-r)	Sqrt(N-3)	Z	Absolute Value of Z	(B) At 5% (1.96)	(C) At 10 % (2.58)
Bankcred	0.216	1.216	0.784	0.439	2.646	0.209	0.209	Do not Reject	Do not Reject
Liqliab	0.117	1.117	0.883	0.235	2.646	0.226	0.226	Do not Reject	Do not Reject
Commbank	-3.204	-2.204	4.204	-	2.646	-2.177	2.177	Do not Reject	Reject
Stock Market Development Indicators	Correlation with PS/GDP = r	1 + r	1 - r	ln(1+r/1-r)	Sqrt(N-3)	Z	Absolute Value of Z	(B) At 5% (1.96)	(C) At 10 % (2.58)
Turnover	0.001	1.001	0.999	0.0020	2.646	0.026	0.026	Do not Reject	Do not Reject
Valtrade	0.108	1.108	0.892	0.217	2.646	1.311	1.311	Do not Reject	Do not Reject
MktCap	-0.00003	0.99997	1.00003	-0.0001	2.646	-0.357	0.357	Do not Reject	Do not Reject

The above results show that all the FDIs are not significant at 5% level of confidence, but *Commbank* is, at 10% level of confidence. All the SMDI are not significant at both 5% and 10% level of confidence, and imply that the SMDIs do not have a positive relationship with PS/GDP. That is, development in the stock market does not relate with growth in the economy. This may imply that financial deepening in PNG is still low and is a reflection of reality at present.

5. Conclusion and Recommendations

FMIs play an important role in ensuring the efficient functioning of financial markets. Limited exposure to international markets and the concentration of oversight and supervision at the Central Bank may have helped the FMIs and the financial system as a whole, evade contagion from the 2008 global financial crisis. However, as a growing economy and an expanding financial system, it can be exposed to new risks arising from interconnectedness. The GFC has shown that, through global integration, interconnectedness and interdependencies of the markets, the FMI is one of the first places for a financial crisis to manifest. Supervisory authorities should continue to improve capacity and strengthen the FMIs. Setting up a regional institution and subscribing to it will help regulators and supervisors enhance capabilities and methodologies and coordinate efforts to mitigate existing risks or capture emerging ones.

References

Bank for International Settlements, (2012), Principles for Financial Market Infrastructures, April.

Bank of Papua New Guinea, Quarterly Economic Bulletin, Various Issues.

Bank of Papua New Guinea, (2007), "Money and Banking in Papua New Guinea," Melbourne University Publishing.

Goodman, et al., (1985), "The Economy of Papua New Guinea: An Independent Review, Development Studies Centre," The Australia National University, Canberra.

Global Financial Crisis and Implications for Developing Countries, G-20 Finance Ministers' Meeting, Sao Paolo, 8 November 2008.

International Monetary Fund, (2013), World Economic Outlook, Transitions and Tensions, October.

Abbreviations

BPNG	-	Bank of Papua New Guinea
BSS	-	Banking Services System
ESA	-	Exchange Settlement Account
GFC	-	Global Financial Crisis
IRC	-	Internal Revenue Commission
KATS	-	Kina Automated Transfer System
NPS	-	National Payments System
NPSA	-	National Payments System Act
PNG	-	Papua New Guinea
PNG LNG		PNG Liquefied Natural Gas
POMSOX		Port Moresby Stock Exchange
RTGS	-	Real Time Gross Settlement

Table A1
Stylised Facts of Financial Market Infrastructures in PNG

SN	FMI Type		Description
1	Payment System		● **The PS** – The payment and settlement of cheques and warrants is facilitated by the central bank. The new National Payment System (NPS) and the launch of the RTGS in October 2013 will enhance the payment system. At this stage we cannot extract data from RTGS system for trend analysis.
2	Capital Market-related FMIs	CSD	
3		SSS	
4		CCP	● **CSD** – The central bank acts as a CSD, keeping securities accounts, and conducting trade in Government securities. The Government is the only issuer of securities and bonds in the form of Treasury bills and Inscribed stocks. It was set up in 1973 when the central bank was established. CDS operations have been in the form of book entry. The NPS project, recently completed and implemented, will enhance the operations of the CDS.
5		TR	
			● **SSS** – As agent of the Government in issuing Government securities, its role covers transfers and settlements of securities by book entry, with manual clearing of cheque payments. The NPS will automate and provide enhancement to the system.
			● **CCP** – The POMSOX facilitates trade in share capital only, and has not ventured into corporate bonds as yet.
			● **TR** – The central bank also acts as the trade repository and keeps database of transaction on Government securities and bonds.

Table A2
Total Number of Participants in the Payments System

Payment System		Multiple Market Participation by PS members			
Total No. of Participants	**33**	*Money*	*Bond*	*Forex*	*Securities*
Banks	4	x	x	x	x
Bank of PNG	1	x (repo)	x	x	
Nonbank Financial Institutions	28		x		x
Money Market					
Total No. of Participants	**5**				
Banks	4				
Bank of PNG	1				
Bond Market					
Total No. of Participants	**48**				
Banks	4				
Bank of PNG	1				
Finance Companies	6				
Microfinance Companies	2				
Savings & Loan Societies	15				
Insurance Companies	15				
Pension Funds	4				
Development Bank	1				
Forex Market					
Total No. of Participants	**7**				
Banks	4				
Bank of PNG	1				
Finance Companies	2				
Securities Market					
Total No. of Participants	**47**				
Banks	4				
Finance Companies	6				
Microfinance Companies	2				
Savings & Loan Societies	15				
Insurance Companies	15				
Pension Funds	4				
Development Bank	1				

Table A3
Annual Market Value of Transactions in the
Payment System, 2003-2013
(US$ Million)

Year	Av. Exc rate	Annual Market Turnover (USD million)				TOTAL
		Money	Bond	FOREX	Securities	
2003	0.2816	658	49	4,062	776	5,545
2004	0.3101	608	278	3,638	693	5,219
2005	0.3224	431	506	4,420	579	5,936
2006	0.3272	178	614	5,480	377	6,648
2007	0.3375	1,781	734	7,360	331	10,205
2008	0.3709	1,150	853	10,159	606	12,769
2009	0.3638	1,240	868	9,364	668	12,139
2010	0.3680	618	926	11,368	573	13,485
2011	0.4240	316	1,216	15,517	956	18,004
2012	0.4800	651	1,136	17,533	1,321	20,641
2013	0.4561	351	1,787	11,696	1,927	15,761

Figure A1
Charts Depicting Annual Turnovers in Different Markets of the Payment System, 2003 - 2013
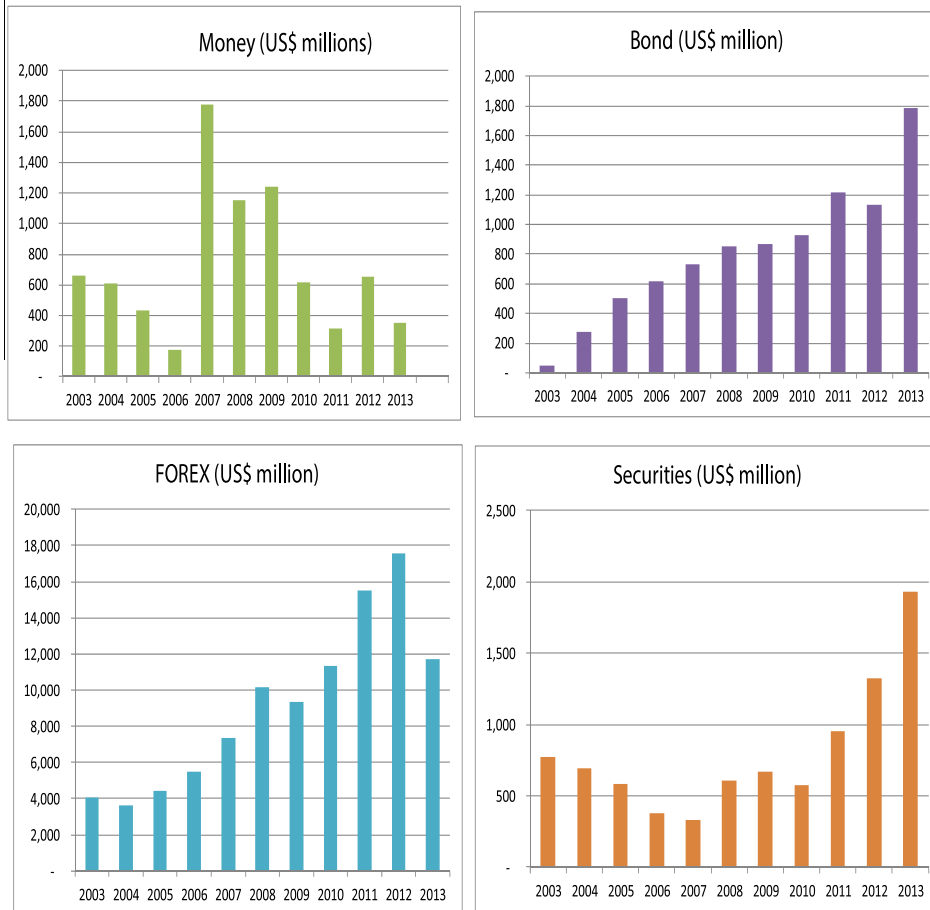
Table A4
Monthly Market Value of Transactions in the
Payments System, 2010-2013
(US$ Million)

	Year	Exc rate (U	Monthly Market Turnover (USD million)				
			Money	Bond	FOREX	Securities	TOTAL
2010	Jan	0.3695	127	881	620	691	2,319
	Feb	0.3640	369	856	853	697	2,776
	Mar	0.3650	68	867	935	753	2,623
	Apr	0.3630	102	870	877	768	2,618
	May	0.3530	23	837	983	712	2,554
	Jun	0.3600	7	863	1,048	706	2,624
	Jul	0.3700	78	899	1,171	704	2,853
	Aug	0.3680	77	895	922	624	2,517
	Sep	0.3750	11	931	942	589	2,472
	Oct	0.3775	66	950	1,007	565	2,589
	Nov	0.3795	21	955	1,071	519	2,567
	Dec	0.3785	-	953	956	590	2,498
2011	Jan	0.3800	-	956	961	1,696	3,613
	Feb	0.3870	-	918	976	644	2,539
	Mar	0.3895	-	952	1,218	633	2,803
	Apr	0.4060	-	1,017	1,361	864	3,242
	May	0.4205	-	1,080	1,406	873	3,359
	Jun	0.4350	67	1,145	1,527	795	3,534
	Jul	0.4411	-	1,189	1,195	882	3,266
	Aug	0.4445	-	1,209	1,415	867	3,490
	Sep	0.4465	-	1,242	1,499	727	3,468
	Oct	0.4550	40	1,294	1,347	741	3,423
	Nov	0.4600	734	1,282	1,308	895	4,219
	Dec	0.4665	235	1,337	1,473	1,051	4,097
2012	Jan	0.4740	16	1,359	1,364	1,170	3,908
	Feb	0.4790	-	1,412	1,393	1,206	4,011
	Mar	0.4820	27	1,459	1,540	1,339	4,366
	Apr	0.4845	-	1,505	1,221	1,359	4,085
	May	0.4840	3	1,526	1,524	1,371	4,424
	Jun	0.4840	119	1,543	1,396	1,407	4,465
	Jul	0.4820	12	1,564	1,683	1,407	4,666
	Aug	0.4795	204	1,527	1,692	1,614	5,036
	Sep	0.4805	85	1,552	1,244	1,590	4,471
	Oct	0.4790	83	1,569	1,565	1,542	4,760
	Nov	0.4765	30	1,582	1,451	1,428	4,491
	Dec	0.4755	98	1,601	1,459	1,309	4,467
2013	Jan	0.4740	207	1,633	1,519	1,460	4,819
	Feb	0.4720	7	1,632	950	1,651	4,240
	Mar	0.4675	0	1,645	1,043	1,890	4,577
	Apr	0.4650	18	1,664	1,549	1,917	5,148
	May	0.4620	63	1,681	1,709	1,992	5,446
	Jun	0.4570	51	1,791	1,543	1,918	5,303
	Jul	0.4420	0	1,732	1,493	1,868	5,093
	Aug	0.4340	0	1,755	1,417	1,872	5,045
	Sep	0.4310	15	1,743	653	1,868	4,279

Table A5
External Integration

Year	X of goods & services	M of goods & services	Total	GDP	EI
	EXTERNAL INTERNAL				
2003	8,671	7,323	15,994	13,241	1.21
2004	8,889	7,920	16,809	13,459	1.25
2005	11,229	8,353	19,582	15,059	1.30
2006	13,816	10,603	24,419	16,897	1.45
2007	15,148	13,206	28,354	18,802	1.51
2008	10,943	13,205	24,148	21,601	1.12
2009	12,612	12,979	25,591	22,331	1.15
2010	16,467	17,094	33,561	26,395	1.27
2011	17,402	17,083	34,485	29,842	1.16
2012	14,190	17,709	31,899	32,666	0.98
2013			-	35,571	0.00

Source: Various Bank of PNG Quarterly Economic Bulletins
2013 data not available/ready.

Chapter 7

THE PHILIPPINE PAYMENT SYSTEM

By
Cristeta Bagsic[1]

1. Introduction

The Committee on Payment and Settlement Systems (CPSS) identifies five types of financial market infrastructure (FMI): payment systems (PS); central counterparties (CCPs); central securities depositories (CSDs); securities and settlement systems (SSSs); and trade repositories (TRs).

In 2012, the CPSS published the 24 Principles of Financial Market Infrastructures (PFMIs). These PFMIs are intended to enhance financial stability. They also codify the international standards set in three reports that were previously published from 2001 to 2004: (a) the Core Principles; (b) the Recommendations for Securities Settlements; and (c) the Recommendations for Central Counterparties.

This report focuses mainly on the relationship of the payment system in the Philippines with the banking system and stock market indicators and the performance and resilience of the large-value, real-time payment system of the Philippines that the Bangko Sentral ng Pilipinas (BSP) owns, operates and oversees – the Philippine Payment and Settlement System (PhilPaSS).

The PhilPaSS was launched in 2002. During the first three months of operation of the PhilPaSS, the transactions were solely interbank settlements. Then, in February 2003, the Philippine Clearing House Corporation (PCHC) transactions were also processed. ATM network members' payments to each other were then added, as well as Payment versus Payment (PvP) in the same year. The following year, Delivery versus Payment (DvP) was added. As the years went by, more institutions and categories of transactions were incorporated.

Thus, the growth in the value and volume of transactions handled by the PhilPaSS speaks not merely of the growth of the Philippine economy in the last decade, but also of the continuing additions and expansion in the institutions handled by the PhilPaSS. Nonetheless, "interbank" transactions still account for more than a third of the value of the transactions during the first 11 months of 2013. That is second only to the BSP's share of 49%. This is further evidence that the Philippine economy remains a highly intermediated one. And, thus, while there is no statute explicitly giving the BSP supervision over the payment system, the fact that the banking system, the primary participant in the payment system, settlement and clearing system, impels the BSP to seek not only de facto, but more importantly, de jure jurisdiction over the payment system.

The importance of payments and settlements in the financial markets cannot be discounted since almost all economic transactions involve some mode of payments to settle obligations and transfer ownership of properties. These transactions range from transfers of deposits and financial instruments to large volume transactions being handled in retail payments systems. The smooth functioning of an economy's payment and settlement system plays an integral role in maintaining a sound and stable financial system. Any failure of the system to appropriately deliver payments and settlements can undermine the confidence of market participants and trigger a contagion that will unduly disrupt the whole economy.

Part of the BSP's responsibilities is to maintain an efficient and fully-functioning payment and settlement system in the country in order to both provide effective means of implementing monetary policy and strengthen the foundation of financial stability. As global linkages deepen and advancement in technological innovations encourage the emergence of newer payment channels, so does the challenge for the BSP to keep in step with risks that may arise from these platforms.

1.1 General Information on the Philippine Economy

The Philippines is an archipelago in the south-eastern region of Asia, with an estimated population of 96.8 million in 2013. The country's population grew from 80.2 million in 2002 to an estimated 95.8 million in 2012. The median age for the Philippines is currently about 22.2 years. Of its population, the United Nations projects that, in 2015, the Philippines will enter its "demographic window" wherein the portion of the population under 15 years old is less than 30% while the share in the population of those above 65 years old is less than 15%, that is the ratio of economically dependent to working age population is significantly

less than 1:1. With this, the Philippines is set to be the next Asian economy to benefit from this demographic phenomenon after India, Malaysia, Mongolia and Myanmar in 2010.

The demographic window phase has historically been associated with high-growth period. For instance, the GDP growth in the first 10 years during their respective demographic windows for Japan, Hong Kong, Singapore, S. Korea, and China were 8.1%, 7.4%, 7.8%, 9.0%, and 10.3%, respectively. Thailand's was understandably much lower at 3.3% as the Asian financial crisis of 1997 overwhelmed the potential benefits from its demographic makeup just as it just entered its demographic window in 1995. This last case highlights the vital role of both the internal and external economic environment to the realisation of any potential benefits from such demographic prospective dividend. Hakkert (2007) emphasises that the "economic benefits [from the demographic window phase] are uncertain and contingent, among other things, on a favourable external and internal economic setting and policy environment, as well as on political and social stability", further pointing out that the bigger share of the working age population "is advantageous only for those countries that can, inter alia, increase employment opportunities with sufficient speed to match the growth in labour supply, maintain growth in labour productivity, improve public health, including [reproductive health] and invest in physical infrastructure" (pp. 7-8).

Figure 1
Selected Demographic Windows in Asia
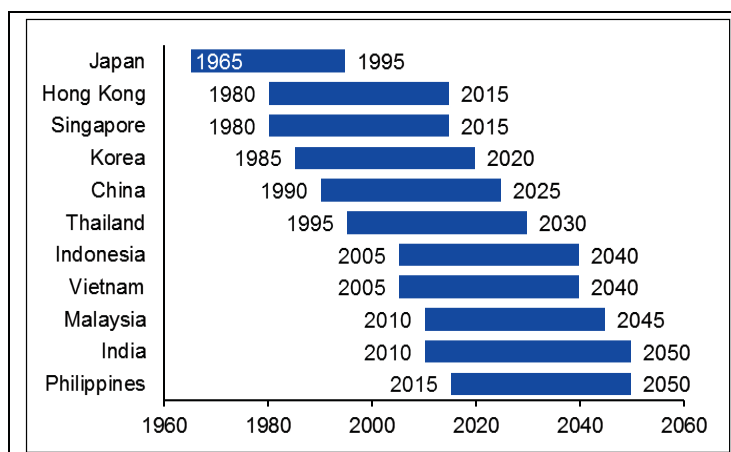
Source: United Nations.

201

1.2 Recent Economic Developments

The history of policy reforms, particularly since the 1997 Asian financial crisis (AFC), and strong domestic demand bear witness to the country's strong macroeconomic fundamentals. In the last ten years, the Philippine economy has exhibited sustained growth rate even as consumer inflation rate has declined and been more stable than in previous periods. Such growth-inflation dynamic was supported by sufficient liquidity and credit amidst a sound and stable banking system, and a robust external payments dynamics. At the same time, solid growth rate and fiscal reforms implemented by the national government have allowed the government to post improved fiscal position (see Table A-2). This solid performance of the Philippine economy is remarkable considering that in the middle of this period the global financial crisis (GFC) of 2008 emerged and required policymakers and economic managers, domestic and multilateral, to be nimble and innovative in order to dull the impacts of the crisis and steer the domestic and global economy to safer waters.

The Philippines' demonstrated growth momentum likewise rests on a favourable inflation environment. Since May 2009, headline inflation has generally been within target. Prudent and nimble monetary policy has been supportive of domestic economic activity and responsive to global push factors that swept a "wall of liquidity" to emerging market economies from advanced economies following the GFC.

Figure 2
Inflation Rate, Actual vs. Target, January 2002-December 2012
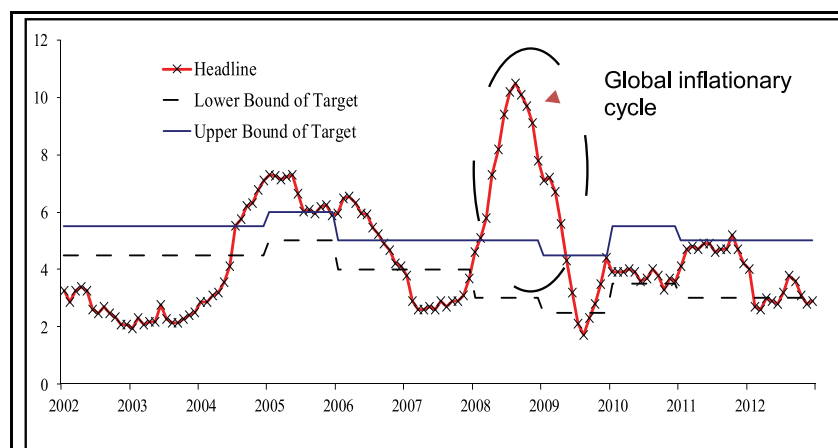
Both domestic supply and demand developments buttressed the Philippine economy against adverse global developments. On the supply side, the services sector remained a consistent driver of growth, with the robust performances of transport, storage and communication; financial intermediation; real estate, renting and business services. On the demand side, increased household and government spending and investments in fixed capital and construction propelled the robust GDP growth rates. Of important note is the growing revenue base which allowed for more spending on critical social and economic priorities. Additionally, the considerable and consistent remittances from overseas Filipinos allowed households to purchasing and investing capabilities.

With the growing economy, liquidity and credit also expanded. Nevertheless, the trends in credit growth did not appear worrisome and has been supportive of a non-inflationary economic growth environment. In fact, when measured as a percent of GDP, credit declined from 54% average in 2002-2006 to below 50% post-2008. Credit growth in recent years has not been unique to the Philippines. The ASEAN central banks responded to this with carefully calibrated monetary policy to prevent rapid credit expansion from exerting inflationary pressures.

Figure 3
Loan Portfolio and Non-Performing Loans,
January 2002-October 2012
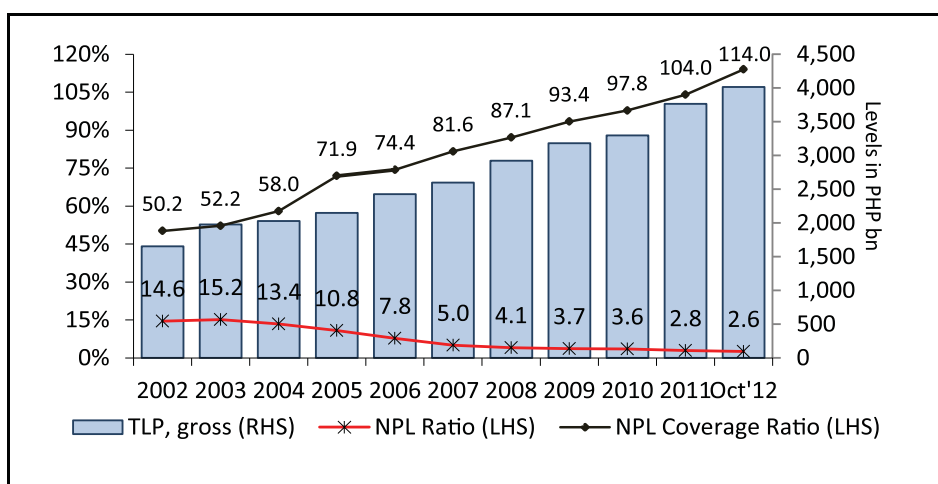
Source: BSP.

Meanwhile, not only did the increased liquidity and credit not fuel inflation, they also have not been shown to lead to any deterioration in the asset quality of the banking system. And because more than a third of the transaction value in the PhilPass is interbank, the health of the banking system is crucial to the robustness of the domestic payment and settlement system.

The Philippine economy's ability to withstand outflows is also important to the health of the payment system. Although the Philippines, along with the other emerging economies also attracted foreign financial flows post-GFC, the majority of its foreign exchange inflows are structural in nature. Through the years, the Philippine economy has experienced sustained inflows of remittances from overseas Filipinos and strong Business Process Outsourcing (BPO) earnings. Owing mostly to its current account surplus, as of end-December 2012, the Philippines has a balance of payments surplus of US$ 9.2 billion.

Meanwhile, the strong foreign exchange inflows have allowed the BSP to build up its gross international reserves (GIR). As of end-December 2012, the GIR level has reached US$84.2 billion, higher by US$8.9 billion or by 11.8% than the end-December 2011 level of US$75.3 billion. At that level, the GIR can cover 12 months worth of imports of goods and payments of services and income. It is equivalent to 5.8 times the country's short-term external debt based on residual maturity and is more than enough to cover the country's total external debt. The major external debt indicators remained strong due to prudent external debt management. For instance, its external debt portfolio remains predominantly medium- to long-term in tenor.

Figure 4
Overseas Filipino Remittances
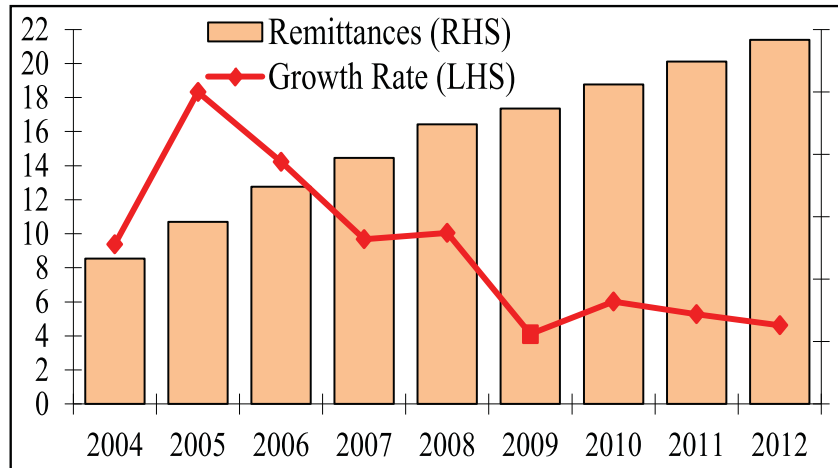
Source: BSP.

Figure 5
Gross International Reserves, 2000-2012 (in billion US$)

Source: BSP.

205
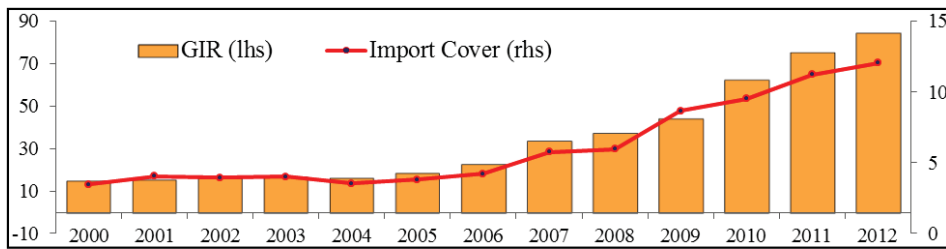
Figure 6
International Reserves in US\$ millions,
percentage change 1997-2012
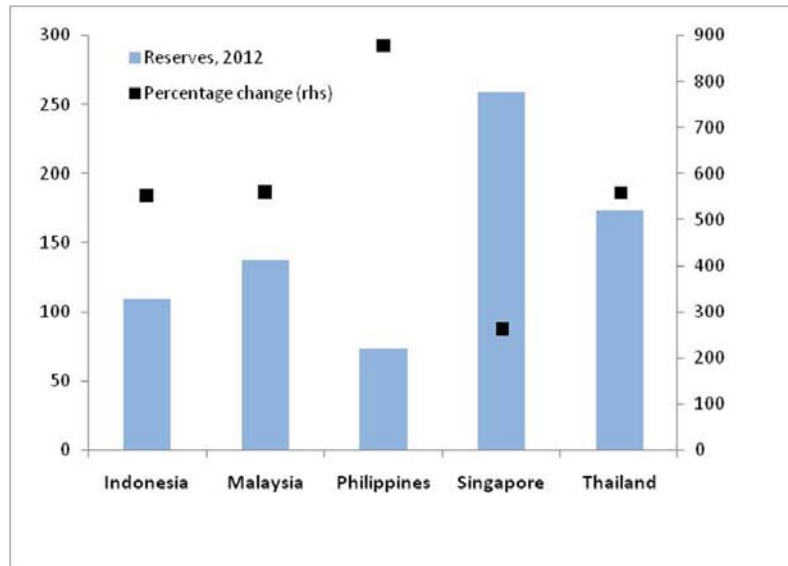
Source: IMF International Financial Statistics.

1.3 FMI Performance during the Global Financial Crisis (GFC) of 2008

Of note is the resilience displayed by the Philippine financial and real sectors during and after the 2008 GFC. Admittedly, asset prices declined in 2008 (i.e., the peso weakened, the stock index declined, and yield on the T-bills increased) (see Figure B-3); however, the market infrastructures were able to service the transactions. The value of transactions posted below 10% growth in 2008. This could be traced to the declining asset prices during that period. Nevertheless, the volume of transactions in the PhilPaSS rose more than 30% for the whole year. (see Table A-3c) Nonetheless, by the fourth quarter of 2008 the lukewarm spending of both households and government, as well as the contraction in external demand could be felt in the PhilPaSS transactions.

The GFC's effect on the transactions in the PhilPaSS continued to be felt beyond 2008. In 2009, even though volume grew by more than 20%, the value of transactions sagged from PHP223 trillion in 2008 to PHP188 trillion in 2009.

Policy measures were implemented both by the central bank and by the fiscal authority. During the period 2008-2009, the challenges brought about by the GFC of 2008 required the BSP to respond along four lines: (a) use of its policy rate and other tools to provide liquidity; (b) support market confidence through market guidance; (c) provide liquidity; and (d) coordinate more closely with its regional central bank peers.

1.4 Objective of the Paper

The paper aims to describe the financial market infrastructure landscape in the Philippines, with particular focus on the large-value payment system that the BSP owns, operates and oversees. It describes the relationship between the payment system and banking sector and stock market indicators for the period 2002-2012. Particular emphasis is given on whether the GFC has left any lasting effect on the nature of such relationship.

2. Philippine Financial Market Infrastructure

2.1 General Policy and Regulation Framework of FMIs in the Philippines

The development of the policy and regulation framework of the FMIs in the Philippines is shared by the various financial regulators. In the Philippines, the banks/deposit-taking institutions are supervised by the BSP and the Philippine Deposit Insurance Corporation (PDIC). The BSP, by virtue of Section 25 of the Republic Act No. 7653, supervises banking institutions and quasi-banks, including their subsidiaries and affiliate engaged in allied activities. The BSP conducts periodic or special examinations of these entities, among others. Meanwhile, the PDIC, empowered by the Republic Act No. 3591, as amended, also monitors the conditions of its member banks. Meanwhile, the securities firms are regulated by the Securities and Exchange Commission (SEC) (Republic Act No. 8799) and insurance companies are under the supervision of the Insurance Commission (the Insurance Code of 1978, or Presidential Decree No. 1460). These regulators are members of the Financial Stability Coordination Council (FSCC), a venue for them to coordinate and work towards the common goal of preventing/abating systemic risks.

Over the last two decades, the Philippine financial market regulation has been shaped by the following structural reforms that in no small way allowed it to withstand two major financial crises – the AFC of 1997 and the GFC of 2008:

- 1993:   Creation of the Bangko Sentral ng Pilipinas;

- 1994:   Liberalisation of foreign bank entry;

- 2000:   Passage of the General Banking Law and Philippine E-Commerce Act;

- 2002:   Adoption by BSP of IT Framework;

- 2003:   Passage of the Special Purpose Vehicle Act;

- 2004:   Adoption of Basel 2;

- 2005:   Passage of the Securitisation Act or Republic Act 9267;

- 2007:   Full implementation of risk-based bank supervision; and

- 2011:   Issuance of the guidelines on the adoption of Philippine Financial Reporting Standards (PFRS) 9; Adoption of phased-in migration to Basel III.

In addition to the above specific statutes, the Philippine financial regulation is also governed by the Electronic Commerce Act of 2000, the Negotiable Instruments Law, the Civil Code of the Philippines, the Insolvency Law; and the various memoranda of agreement and participation agreements.

Meanwhile, in addition to the institutions-based regulation, there are also financial regulation arrangements: the Financial Sector Forum (FSF), and FSCC. The FSF was created in 2004 through a Memorandum of Agreement among the BSP, PDIC, SEC and IC (Insurance Commission) to serve as a venue for consultation, exchange of information and ideas, and coordination of regulatory and supervisory activities of the member agencies. Membership to the FSF is voluntary.

Meanwhile, the FSCC is composed of the members of the FSF, plus the Department of Finance. Its purpose is to enhance the coordination on financial stability initiatives. In particular, the FSCC is tasked with the responsibilities of formulating policies that will mitigate the buildup of systemic risks, designing the institutional arrangements and processes that will be followed in the event of

financial crisis, and recommending to the legislature laws intended to enhance financial stability.

2.2 Oversight of and Supervisory Authority over FMIs in the Philippines

2.2.1 The Payment System

One of the avowed pillars of the BSP is the pursuit of an efficient and reliable payment system. The Philippine economy remains a highly intermediated one. As such, disruptions in the payment and settlement of obligations would show up in the cash flows of banks. Thus, the BSP being the supervisor of the banking system is significantly invested in ensuring the reliability of payment system infrastructure. At the same time, and with the major share of the banking system in financial markets in the Philippines, the performance the banking sector can drive the fate of the financial markets, affecting both financial stability and – since financial markets are important to the transmission channel – monetary policy.

Because of the de facto nature of the BSP's current oversight and regulation of the payment system, the Payment and Settlement Systems Act has been proposed to the Philippine Congress.

2.2.2 Central Securities Depositories (CSDs)

For government securities, the CSD is the Registry of Scripless Securities (RoSS). It is maintained and administered by the Bureau of the Treasury. The RoSS handles the registration of ownership and transfers, as well as encumbrances, of scripless Treasury bills and Treasury bonds out of the Securities Account of a Government Securities Eligible Dealer (GSED) into the Securities Account of the counterparty GSED/non-GSED.

Meanwhile, the Philippine Depository and Trust Corporation (PDTC) was incorporated in 1995 to act as depository of any kind of securities, monetary or financial instruments, and their derivatives. Transactions in the following markets are handled by the PDTC: equities market, fixed income spot market, fixed income repo market, and fixed income securities lending transaction market.

2.3 The Philippine Payments System

The prevalent payment media in the Philippines are cash and non-cash alternatives like checks, credit/debit cards, direct debit/credit transfers, ATM

209

cards, electronic banking, and electronic-money and stored value cards. In the Philippines, the majority of payment service providers are banks.

The Philippine payments system can be delineated into large-value payment system and the retail payment system. The large-value, real time gross settlement system – the PhilPaSS – was established by the BSP in 2002. The PhilPaSS supports the three-pillar approach (price stability, financial stability, and safe and reliable payment system) of the BSP in the conduct of its central banking duties. It started operation in November of 2002 in place of the Multi-transaction Interbank Payment System or MIPS. PhilPaSS is owned and operated by the BSP.

The BSP performs four roles in the payment system: (1) It is the operator of the PhilPaSS, a real-time gross settlement system (RTGS); (2) a policymaker for issues relating to payments and settlements; (3) a provider of liquidity and credit facilities for banks via overnight repos, the Intraday Liquidity Facility (ILF), and the Overdraft Credit Line Facility (OCL); and (4) the settlement bank for the transactions processed through the system. In relation to the fourth role, the participants/counterparties therefore maintain demand deposit accounts (DDAs) with the BSP.

Other participants in the PhilPaSS are the Bureau of the Treasury, universal/ commercial banks, specialised government banks, thrift banks, savings banks, rural banks, non-bank with quasi-banking facility (NBQBs), the Philippine Clearing House Corporation, and the Philippine Dealing Exchange.

The predecessor of the PhilPaSS, the Multi-transaction Interbank Payment System (MIPS) was an electronic, net clearing system used to settle interbank transactions. The Bankers Association of the Philippines and the PCHC operated it in coordination with the BSP. In contrast, the PhilPaSS is a real-time gross settlement system that currently settles not only interbank transactions but also payments for debt securities, the peso leg of foreign exchange transactions, ATM consortia cross-payments among its members, and check clearing results, among others. Note, however, that only two (MegaLink and BancNet) of the five ATM switch operators in the Philippines settle transactions among the participants and members via the PhilPaSS. The other three (ExpressNet, ENCASH, and NATIONLINK) use settlement/depository banks to implement final settlement of their ATM transactions.

In 2010, the PhilPaSS-REMIT was implemented by the BSP. It is to allow for the electronic settlement of overseas Filipino (OF) remittances from overseas

branches of local banks or from correspondent banks and partner remittances agencies abroad for credit to accounts of the beneficiaries of the OFs maintained with banks in the Philippines. During its fourth year of implementation, it already accounts for almost 30% of the volume of transactions in the PhilPaSS (see Table A-3d).

As part of the BSP risk management, the PhilPaSS has two backup systems. In case these fail, the BSP will activate the Electronic Fund Transfer Instruction System (EFTIS). The EFTIS is a platform that was developed and implemented in 1997 and is still being used by Bureau of Internal Revenue and Bureau of Customs accredited banks to transfer peso fund to the account of the national government (NG) with the BSP.

Aside from risk arising from the hardware/software, there is also the risk arising from the PhilPaSS' interconnectedness with the foreign exchange market through the Philippine Domestic Dollar Transfer System (PDDTS). The PDDTS is a local US dollar payment system established in 1995 and used by the banks to transfer US dollar funds from one Philippine bank to another on the same day without needing to go through correspondent banks in the US. In 2003, PvP for interbank USD-peso transactions with the dollar leg settling in PDDTS and the peso leg settling in the PhilPaSS was implemented. Settlement is through book transfers in the US dollar accounts of the participating banks maintained with the USD settlement bank (currently Citibank). Both the PDDTS and PvP are under BSP oversight as systematically important payment systems. Table A-3d shows that the PvP transactions account for 9.4% of the total value of transactions in the PhilPaSS in January-November 2013.

The same risk from interconnectedness arises from the PhilPaSS's direct link with the government securities market through the DvP/eDvP transactions processed via the system. To some extent, the same can be said about risks from the stock market, except that it is more difficult to estimate its possible degree since these transactions are not indirectly settled via PhilPaSS and not as a separate account line.

Figure 7 shows the growth in the value and volume of transactions processed through the PhilPaSS since 2003. Since it is a developing system, some of the growth is attributed to increasing coverage. For instance, the year 2006 was registered the highest growth in value at 126%, but that was also the year when BSP transactions first appeared among the covered transactions even as most of the previously reported account lines in Table A-3a posted increases. As a

system, the GFC did not appear to have constrained the PhilPaSS as it is shown to have been able to handle the higher volume even as the value of transactions in 2009 and 2010 are lower than in 2008.

Table 1 below shows that the coefficient of variation (CV) for the four items (total, repos, PvP, and DvP) have all declined during the post-GFC period. Foreign exchange posted the biggest decline in volatility. However, the coefficient of variation for repo seems to be relatively high during the post-2008 period compared to the CV of foreign exchange and government securities.

Figure 7
Value and Volume of Transactions in the Payment System, 2003-2012
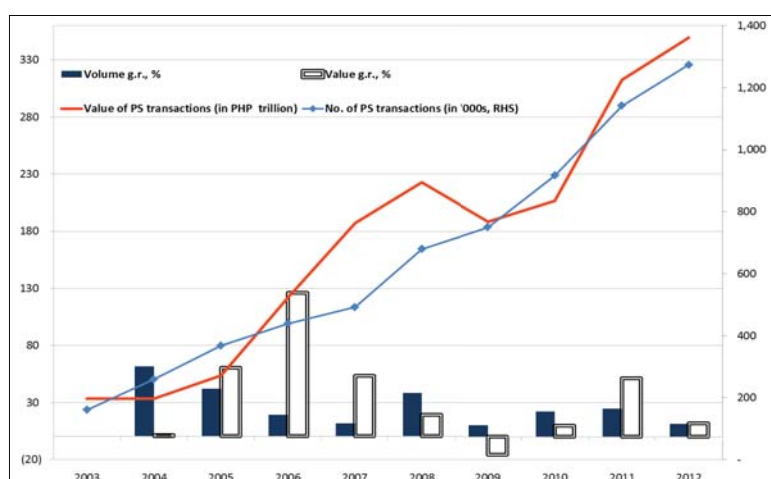
Source: BSP.

Table 1
Coefficient of Variation, January 2002-November 2013

	2003-2013	Pre-2008	Post 2008
Value of Transactions (in PHP)			
Total	0.62	0.73	0.28
Repo	1.35		1.38
PvP: Foreign exchange	0.43	0.58	0.13
DvP/eDvP: Government securities	0.88	0.55	0.66
Volume of Transactions			
Total	0.57	0.36	0.22
Repo	1.29		1.35
PvP: Foreign exchange	0.32	0.36	0.13
DvP/eDvP: Government securities	0.55	0.45	0.40

Source: BSP for data, author's calculation.

3. Financial Statistics: Financial and Stock Market Development Indicators

3.1 Financial Development Indicators

As mentioned earlier in the first section, ample liquidity and sufficient credit supported the Philippine growth dynamics in the last decade. Private sector credit was little changed from 2002 to 2012 suggesting that credit just grew in tandem with economic growth, that is borrowing went to the productive sectors. The ratio of credit to GDP (BANKCRED) was lowest during the period in 2007 at 31%, the year before the GFC and did not break 35% until 2012.

LIQLIAB posted a 5 percentage point increase from 2002 to 2012. The behaviour of BANKCRED vis-a-vis LIQLIAB (M3-to-GDP) would seem to suggest that either the lending requirements of banks were not significantly relaxed during the period or that there was no significant increase in loan demand.

Consistent with the BANKCRED data, COMMBANK (% share of the total assets of banks to the sum of the assets of banks and the central bank) also declined during the period from 75% to 68%.

Meanwhile, if we focus on the quarterly data for 2008 (Figure B-1), we see that BANKCRED edged higher each quarter, while LIQLIAB was stable during the first 3 quarters but was clearly higher at end-4Q 2008. Note also that in 4Q 2008, PS (value of transactions in the PhilPaSS as a percent of GDP) clearly plunged.

3.2 Stock Market Development Indicators

Market capitalisation of the Philippine stock market as a percent of GDP (MKTCAP) declined from 116% in 2007 to 53% in 2008, reflecting the decline in the PSEi (see Figure B-3). The strong performance of the PSE in more recent periods is reflected in the rise in MKTCAP to 104% in 2012.

Meanwhile, in terms of VALTRADE (value of total transactions for the period as a percent of GDP) and TURNOVER (value of total transactions for the period as a percent of market capitalisation) we see that market activity surged in 2007.

Table 2
Key Indicators, 2002-2012

		Financial Development Indicators			Stock Market Development Indicators		
	PS	**BANKCRED**	**COMMBANK**	**LIQLIAB**	**MKTCAP**	**VALTRADE**	**TURNOVER**
	(%) of GDP	(%) of GDP	(%) of Total Banking System and Central Bank Assets	(%) of GDP	(%) of GDP	(%) of GDP	(%) of Market Capitalization
2002	57.21	40.84	74.56	43.97	49.62	3.80	7.67
2003	730.78	38.75	73.72	42.30	65.39	3.20	4.89
2004	656.91	36.11	76.86	41.43	93.08	4.03	4.33
2005	949.70	32.48	77.54	41.20	104.77	6.75	6.45
2006	1,945.05	31.36	76.04	45.76	114.38	9.13	7.98
2007	2,714.85	30.96	72.05	46.05	115.52	19.42	16.81
2008	2,888.41	32.28	71.72	47.51	52.70	9.89	18.77
2009	2,348.34	33.59	71.73	49.51	75.12	12.39	16.49
2010	2,294.82	32.55	69.35	49.51	98.47	13.41	13.62
2011	3,220.66	34.94	66.86	48.16	89.60	14.66	16.36
2012	3,309.46	37.80	67.77	48.95	103.46	16.77	16.21

Source: BSP, National Statistical Coordination Board; Philippine Stock Exchange.

4. Analysis of Financial System Indicators Pre- and Post-GFC

4.1 Data and Methodology

4.1.1 Data

From its decline in Q2 2008, PS (value of transaction in PhilPaSS as a % of GDP) exhibited a U-shape recovery until it reached 32% in Q1 2011 from 23% of the previous quarter. (Figure B-1) The financial development indicators identified for the country studies – BANKCRED, COMMBANK, and LIQLIAB – were relatively stable in 2008. For the period 2003-2012, they did not exhibit sharp movements. This is consistent with the view that the stable and sound banking system of the Philippines has been a major linchpin of the solid growth performance of the Philippine economy in the last decade.

Meanwhile, Figure B-2 shows the sharp decline in MKTCAP in 2008 reflecting the drop in asset prices during that time. As prices went down, VALTRADE also did. Note, however, that TURNOVER did not drop as much, showing that participation in the stock market or market activity has been relatively stable, and has been gradually increasing since 2003.

4.1.2 Methodology

We use principal components analysis (PCA) to investigate the extent of the interconnection among the set of variables on financial development and stock market development that have been identified for the group to investigate vis-à-vis the PhilPaSS data. As proxy for such interconnection we look at the first principal component.

PCA is a widely used tool from applied linear algebra that can reveal hidden, yet simplified, dynamics among a set of variables. To this end, PCA calculates new variables – the principal components—which are linear combinations of the original data. The first principal component should account for the largest proportion of the variance of the data set. The second principal component has to be orthogonal to the first.

4.2 Results for Financial Development Indicators

For the three periods investigated through PCA using correlations of quarterly data from Q1 2003 to Q4 2012, the first principal component depicts more than 60% of the behaviour of the system, that is the total variation of the system,

that is composed of PS, LIQLIAB, COMMBANK and BANKCRED. It is notable, however, that while LIQLIAB was a major driver pre-GFC, it was not a major determinant post-GFC.

LIQLIAB, COMMBANK and BANKCRED are highly and significantly (at 1%) correlated with PS. LIQLIAB is positively correlated with PS at 74%, while COMMBANK and BANKCRED are negatively associated with PS at -78% and -49%, respectively. However, when the periods are sliced into pre- and post-GFC, COMMBANK is insignificant during the pre-GFC period, while it is LIQLIAB that is insignificant during the post-GFC period. Also, during the post-GFC period, BANKCRED became positively correlated (62%) with PS from having -84% correlation with PS pre-GFC. (Tables A-7 to A-9) This is consistent with the expansion in credit seen recently.

4.3 Results for Stock Market Development Indicators

In the case of the system defined by PS and stock market development indicators (MKTCAP, VALTRADE and TURNOVER), their first principal component explains 87% of the behaviour of the system pre-GFC, but only explains 55% post-2008.

Using the full-sample and pre-GFC data, MKTCAP, VALTRADE and TURNOVER are all significantly correlated with PS. Post-2008, however, only MKTCAP is significantly correlated with PS at 59%, reflected in the results of the PCA. In recent years, the PSEi proved to be one of the top performing bourses as both pull (i.e., growth performance of the Philippine economy, upgrades in credit ratings to investment grade status, among others) and push factors (i.e., extra low interest rates in advanced economies, among others) drove funds to the PSE.

Thus, it appears from the above results that the payment system is more interconnected with the stock market dynamics than the financial development indicators. This is not to say that the interconnection with financial market development is trivial, though. Both areas need careful monitoring and more explicit mapping of interrelationship with the payment system. However, our results can warrant further investigation into the role of other asset markets in the dynamics of the payment system.

216

5. Conclusion and Recommendation

The Philippine financial system and infrastructure were left unscathed by the GFC. Nevertheless, the challenges in ensuring their continued stability and soundness are real and need to be comprehensively tackled by the various regulators acting in concert. As part of this thrust, there is the need to develop the various FMIs in accordance with the 24 PFMIs and to map out their interconnectedness.

As a basis for any recovery framework, an analytical framework towards assessing the interconnectedness among FMIs is useful. For instance, the interconnectedness may be system-based, institution-based or environment-based (common use of FMIs of the SWIFT system is an example of environment-based interdependence). Understanding such interconnectedness can help in designing and sequencing the recovery tools to employ. The links between FMIs are critical not only in terms of cooperation among them but, more importantly, with respect to the coordination among their supervisors/regulators. In order for this mapping of interconnectedness to proceed and the results useful, the process for the collection and sharing of data and statistics need to be agreed on by the different regulators.

Meanwhile, among the FMIs, trade repository (TR) is a relatively new concept. The monetary authorities, as the issuer of the domestic currency, should have readily available information on over-the-counter derivatives (OTCD) transactions affecting the country's payment and settlement systems and the liquidity of the domestic currency; and the capacity to monitor any speculative activities being performed against the domestic currency. The data generated by TR pertaining can be useful in monitoring transactions that could affect the transmission of monetary policy.

In the case of the Philippines, an updated legal framework is required. Furthermore, capacity building and adequate resources both for the institutions involved and the regulators are needed. The supervisors/policymakers, and market players can acquire/improve the capabilities needed for the successful implementation and assessment of FMIs. More importantly, the development of enforcement tools and cooperative oversight framework can be useful. Lastly, given the complexity and coverage of the principles, clear sharing of the responsibilities need to be clearly specified. Unambiguity in the sharing of responsibilities can help prevent regulatory arbitrage and paralysis during crisis situations.

References

Committee on Payment and Settlement Systems, (2012), "Assessing Methodology for the Principles of Financial Market Infrastructures and the Responsibilities of Authorities," Consultative Report, Technical Committee of the International Organization of Securities Commissions, BIS-OICU-IOSCO, April.

Committee on Payment and Settlement Systems, (2012), "Principles of Financial Market Infrastructures," Technical Committee of the International Organization of Securities Commissions, BIS-OICU-IOSCO, April.

Hakkert, R., (2007), "The Demographic Bonus and Population in Active Ages," Research Paper No. 7 of the IPEA/UNFPA Project RLA5P201: Regional Support to Population and Development in the Implementation of the MDGs in the LAC Region, Available at: http://www.unfpa.org.br/lacodm/arquivos/rp7.pdf

Santos, B., (2008), "The BSP's Payment and Settlement System," Bangko Sentral Review, Available at: http://www.bsp.gov.ph/downloads/publications/2008/BS08_A3.pdf

United Nations, (2004), "World Population to 2300," United Nations Department of Economic and Social Affairs/Population Division, Available at: <http://www.un.org/esa/population/publications/longrange2/WorldPop2300final.pdf>

Table A-1
List of Abbreviations

CPSS:	Committee on Payment and Settlement Systems
IOSCO:	International Organisation of Securities Commissions
PFMIs:	Principles for Financial Market Infrastructures
CCPs:	Central Counterparties
PS:	Payment Systems
CSDs:	Central Securities Depositories
SSSs:	Securities and Settlement Systems
TRs:	Trade Repositories

Table A-2a
Key Indicators, 2002-2012

	Indicators	2002-2006 Average	2007-2011 Average	2012
Sustained growth momentum	Real GDP growth (2000=100)	5.1	4.7	6.6
Manageable inflation	Headline inflation (2006=100)	4.4	4.8	3.2
Improved fiscal position	Fiscal balance (% of GDP)	(3.4)	(2.1)	(2.3)
Ample liquidity and credit	Domestic Liquidity (% of GDP)	43.5	48.0	48.9
	Domestic Credits (% of GDP)	53.9	47.8	49.6
Sound and stable banking system	Non-performing loans (% of total loans)	11.1	3.2	1.9
	Capital Adequacy Ratio (consolidated basis)	17.6	16.5	18.4
Robust external payments dynamics	Current Account Balance (% of GDP)	1.6	4.0	2.8
	GIR (in months of imports)	3.9	8.3	12.1
	External debt (% of GDP)	58.3	31.7	24.1
	External debt service burden (% of exports of goods, receipts of services & income)	14.7	9.6	7.4

Sources: Bangko Sentral ng Pilipinas; National Statistical Coordination Board; National Statistics Office.

Table A-2b
Key Indicators, 2012

	2012
Economy (in US$ million)	142,817.88
Population (million)	95.8
Area (sq. km)	300,000
Geographical Type	C (archipelago)
Capital Account Openness	Liberalized
External Integration (%)	96.02
Financial Development (%)	37.80
Payment System Total (% of GDP)	3,309.46
Payment System (% of GDP)	3,309.46

Note:

1. "Economy (in US $ dollars)" in 2012;

2. "Population (in millions)" in 2012;

3. "Area (square kilometers)";

4. "GT" is Geographical type A. Island, B. Landlocked C. Neither A or B;

5. "KA" is Capital Account A. Not liberalized B. Partially liberalized C. Fully liberalized;

6. External Integration (EI) indicator is (X of goods and services + M of goods and services)/GDP; in 2012;

7. Financial Development (FD) indicator is the ratio of total credit of commercial banks and other deposit-taking banks to the private sector by nominal GDP in 2012;

8. Payment System Total (PST) Transaction Indicator is total transations in the economy by GDP in 2012;

9. The identified transaction of the Payment System (PS), which is total transations in the economy by GDP in 2012.

Table A-3a
Value of Transactions in the Payment System, in PHP billion

Type of Transaction	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Jan-Nov 2013
Interbank	29,969.54	23,885.49	36,459.81	58,094.78	84,320.96	92,477.25	71,345.72	76,449.16	107,254.66	106,655.07	118,942.86
BSP				38,204.56	67,862.84	92,481.11	75,927.47	81,447.09	153,373.65	191,577.87	159,647.06
Philippine Clearing House Corp. (PCHC)	2,893.45	3,384.84	3,770.25	2,672.70	3,378.18	3,057.92	3,209.41	3,420.25	3,697.67	4,046.91	4,009.28
PVP: Foreign exchange, PHP leg	368.07	5,485.82	11,438.83	19,662.37	27,439.20	30,064.43	32,946.31	37,824.10	34,593.27	33,587.41	30,552.89
DvP/eDVP: Government securities		83.60	1,038.57	1,681.35	1,909.53	1,851.26	2,321.00	5,097.01	3,955.16	5,296.86	6,015.58
EFTIS		754.15	1,156.72	1,314.41	1,745.73	2,196.48	2,008.37	1,575.64	1,123.56	1,208.45	1,238.19
ECWS				284.65	379.93	385.52	353.95	405.32	473.06	486.84	405.22
Repo						14.02	90.36	78.15	24.89	5.41	
Remit								4.00	12.63	14.94	14.39
ATM network crosspayments between member banks	5.55	42.79	57.22	62.44	90.43	91.13	89.61	93.80	137.40	398.36	408.25
Others						392.05	189.30	218.84	7,960.42	6,362.84	4,133.97
TOTAL	**33,236.61**	**33,636.69**	**53,921.39**	**121,977.26**	**187,126.80**	**223,011.16**	**188,481.50**	**206,613.37**	**312,606.36**	**349,640.96**	**325,367.68**

Notes:

Payment Versus Payment (PvP) transactions consist of interbank sale and purchase of foreign currency (USD) where the settlement of the peso (PHP) leg is done thru PhilPaSS. Settlement of FX purchased will only take place upon settlement of the peso leg.

Delivery Versus Payment (DvP) transactions consist of interbank sale and purchase of government securities (GS) where the settlement of the securities will only take place upon delivery of payment (in PhP) thru PhilPaSS. The *expanded DvP (eDvP)* covers tertiary or public market trading.

Electronic Funds Transfer Instruction System (EFTIS) caters to bank's remittances of revenue collections for the account of the Bureau of Treasury (BTr) as well as intra-account transfers
Electronic Cash Withdrawal System (ECWS) serves as banks' facility to transmit electronic instructions to PhilPaSS for cash withdrawal transactions for their daily cash requirements based on pre-approved cash denomination orders.

BSP transactions cover transactions by the Treasury Department, Department of Loans and Credit, Cash Department, and checkless transactions by the Financial Accounting Department and the *"Others"* transactions include the Intraday Liquidity Facility, and Foreign Loan Approval and Registration System (FLAReS), among others. FLAReS covers borrowings of public and private sector entities from foreign creditors, offshore banking units and foreign currency deposit units (FCDU) of banks.

221

Table A-3b
Volume of Transactions in the Payment System

Type of Transaction	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Jan-Nov 2013
Interbank	95,272	68,296	72,907	97,339	129,876	168,931	203,365	252,677	294,574	349,746	384,281
BSP				19,464	46,477	63,527	48,211	50,363	53,757	57,561	50,331
Philippine Clearing House Corp. (PCHC)	48,122	54,349	64,282	69,915	67,749	66,613	65,014	63,094	53,099	35,350	29,405
PVP: Foreign exchange, PHP leg	4,209	66,213	130,412	151,731	156,075	173,957	192,791	208,741	206,635	224,423	183,937
DvP/eDVP: Government securities		1,665	17,034	24,320	20,798	29,089	33,429	49,100	38,886	43,556	43,494
EFTIS		26,578	36,150	33,087	31,766	31,374	34,141	33,305	31,603	32,460	30,733
ECWS				3,517	4,413	5,167	5,041	4,798	5,280	4,981	4,156
Repo						123	305	806	225	97	
Remit								112,636	320,841	380,150	358,809
ATM network crosspayments between member banks	12,604	42,120	47,353	39,655	34,430	35,233	28,137	18,695	15,875	18,798	16,538
Others						105,557	139,157	122,089	120,812	126,201	112,507
TOTAL	160,207.00	259,221.00	368,138	439,028	491,584	679,571	749,591	916,304	1,141,587	1,273,323	1,214,191

Notes:

Payment Versus Payment (PvP) transactions consist of interbank sale and purchase of foreign currency (USD) where the settlement of the peso (PHP) leg is done thru PhilPaSS. Settlement of FX purchased will only take place upon settlement of the peso leg.

Delivery Versus Payment (DvP) transactions consist of interbank sale and purchase of government securities (GS) where the settlement of the securities will only take place upon delivery of payment (in PhP) thru PhilPaSS. The *expanded DvP (eDvP)* covers tertiary or public market trading.

Electronic Funds Transfer Instruction System (EFTIS) caters to bank's remittances of revenue collections for the account of the Bureau of Treasury (BTr) as well as intra-account transfers *Electronic Cash Withdrawal System (ECWS)* serves as banks' facility to transmit electronic instructions to PhilPaSS for cash withdrawal transactions for their daily cash requirements based on pre-approved cash denomination orders.

BSP transactions cover transactions by the Treasury Department, Department of Loans and Credit, Cash Department, and checkless transactions by the Financial Accounting Department and the *"Others"* transactions include the Intraday Liquidity Facility, and Foreign Loan Approval and Registration System (FLAReS), among others. FLAReS covers borrowings of public and private sector entities from foreign creditors, offshore banking units and foreign currency deposit units (FCDU) of banks.

222

Table A-3c Payment System Transactions, Annual Growth Rates, in %, 2004-2012 Table A-3d Payment System Transactions, 2003 - November 2013

Type of Transaction	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Interbank		(20.30)	52.64	59.34	45.14	9.67	(22.85)	7.15	40.30	(0.56)
BSP					77.63	36.28	(17.90)	7.27	88.31	24.91
Philippine Clearing House Corp. (PCHC)		16.98	11.39	(29.11)	26.40	(9.48)	4.95	6.57	8.11	9.44
PVP: Foreign exchange, PHP leg		1,390.44	108.52	71.89	39.55	9.57	9.59	14.81	(8.54)	(2.91)
DvP/eDVP: Government securities			1,142.32	61.89	13.57	(3.05)	25.37	119.60	(22.40)	33.92
EFTIS			53.38	13.63	32.82	25.82	(8.56)	(21.55)	(28.69)	7.55
ECWS					33.47	1.47	(8.19)	14.51	16.71	2.91
Repo							544.29	(13.51)	(68.15)	(78.25)
Remit									215.45	18.33
ATM network crosspayments between member banks		671.39	33.70	9.12	44.84	0.77	(1.67)	4.68	46.48	189.93
Others							(51.71)	15.60	3,537.61	(20.07)
TOTAL		**1.20**	**60.31**	**126.21**	**53.41**	**19.18**	**(15.48)**	**9.62**	**51.30**	**11.85**

Volume of Transactions

Type of Transaction	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Interbank		(28.31)	6.75	33.51	33.43	30.07	20.38	24.25	16.58	18.73
BSP					138.78	36.68	(24.11)	4.46	6.74	7.08
Philippine Clearing House Corp. (PCHC)		12.94	18.28	8.76	(3.10)	(1.68)	(2.40)	(2.95)	(15.84)	(33.43)
PVP: Foreign exchange, PHP leg		1,473.13	96.96	16.35	2.86	11.46	10.83	8.27	(1.01)	8.61
DvP/eDVP: Government securities			923.06	42.77	(14.48)	39.86	14.92	46.88	(20.80)	12.01
EFTIS			36.01	(8.47)	(3.99)	(1.23)	8.82	(2.45)	(5.11)	2.71
ECWS					25.48	17.09	(2.44)	(4.82)	10.05	(5.66)
Repo							147.97	164.26	(72.08)	(56.89)
Remit									184.85	18.49
ATM network crosspayments between member banks		234.18	12.42	(16.26)	(13.18)	2.33	(20.14)	(33.56)	(15.08)	18.41
Others							31.83	(12.27)	(1.05)	4.46
TOTAL		**61.80**	**42.02**	**19.26**	**11.97**	**38.24**	**10.30**	**22.24**	**24.59**	**11.54**

223

Table A-3d

Payment System Transactions, 2003 - November 2013

Value, % share to total

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Jan-Nov 2013
Interbank	90.17	71.01	67.62	47.63	45.06	41.47	37.85	37.00	34.31	30.50	36.56
BSP				31.32	36.27	41.47	40.28	39.42	49.06	54.79	49.07
Philippine Clearing House Corp. (PCHC)	8.71	10.06	6.99	2.19	1.81	1.37	1.70	1.66	1.18	1.16	1.23
PVP: Foreign exchange, PHP leg	1.11	16.31	21.21	16.12	14.66	13.48	17.48	18.31	11.07	9.61	9.39
DvP/eDVP: Government securities		0.25	1.93	1.38	1.02	0.83	1.23	2.47	1.27	1.51	1.85
EFTIS		2.24	2.15	1.08	0.93	0.98	1.07	0.76	0.36	0.35	0.38
ECWS				0.23	0.20	0.17	0.19	0.20	0.15	0.14	0.12
Repo						0.01	0.05	0.04	0.01	0.002	
Remit								0.002	0.004	0.004	0.004
ATM network crosspayments between member banks	0.02	0.13	0.11	0.05	0.05	0.04	0.05	0.05	0.04	0.11	0.13
Others						0.18	0.10	0.11	2.55	1.82	1.27
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Volume, % share to total

Type of Transaction	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Jan-Nov 2013
Interbank	59.47	26.35	19.80	22.17	26.42	24.86	27.13	27.58	25.80	27.47	31.65
BSP				4.43	9.45	9.35	6.43	5.50	4.71	4.52	4.15
Philippine Clearing House Corp. (PCHC)	30.04	20.97	17.46	15.92	13.78	9.80	8.67	6.89	4.65	2.78	2.42
PVP: Foreign exchange, PHP leg	2.63	25.54	35.42	34.56	31.75	25.60	25.72	22.78	18.10	17.62	15.15
DvP/eDVP: Government securities		0.64	4.63	5.54	4.23	4.28	4.46	5.36	3.41	3.42	3.58
EFTIS		10.25	9.82	7.54	6.46	4.62	4.55	3.63	2.77	2.55	2.53
ECWS				0.80	0.90	0.76	0.67	0.52	0.46	0.39	0.34
Repo						0.02	0.04	0.09	0.02	0.01	
Remit								12.29	28.10	29.85	29.55
ATM network crosspayments between member banks	7.87	16.25	12.86	9.03	7.00	5.18	3.75	2.04	1.39	1.48	1.36
Others						15.53	18.56	13.32	10.58	9.91	9.27
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Table A-4
Coefficient of Variation, Monthly Transactions,
January 2003 - November 2013

	Average - Full	Average Pre	Average Post	Stdev - Full	Stdev Pre	Stdev Post	CV-Full	CV-Pre	CV-Post
No. of PS transactions	57,917.53	28,636.30	89,745.69	33,000.65	10,451.03	19,648.58	0.57	0.36	0.22
Value of PS transactions (in PHP billion)	15,536.12	7,164.98	23,435.76	9,662.57	5,261.33	6,541.55	0.62	0.73	0.28
PHP:USD	48.03	52.56	44.15	5.20	3.80	2.25	0.11	0.07	0.05
Value of PS transactions (in US$ billion)	347.04	144.11	538.71	236.32	117.22	172.27	0.68	0.81	0.32
Repo (PHP million)	3,325.51		3,369.63	4,488.72		4,634.53	1.35		1.38
PvP (PHP million)	2,181,509.84	1,287,885.66	2,872,948.82	944,349.37	750,103.55	372,583.98	0.43	0.58	0.13
DvP/eDvP: Government securities (PHP million)	261,159.98	114,952.38	384,501.84	230,545.58	63,665.62	252,132.51	0.88	0.55	0.66

225

Table A-5
Descriptive Statistics: Financial Development Indicators, (Quarterly, Q1 2003-Q4 2012)

	PS	LIQLIAB	COMMBANK	BANKCRED
Mean	2,111.59	44.47	72.52	33.50
Median	2,352.69	45.30	71.97	32.51
Maximum	3,732.94	49.51	77.54	40.22
Minimum	585.41	39.43	66.14	29.36
Std. Dev.	994.95	2.76	3.46	2.96
Skewness	(0.30)	(0.04)	(0.30)	0.60
Kurtosis	1.69	1.78	1.87	2.33
Jarque-Bera	3.44	2.48	2.73	3.16
Probability	0.18	0.29	0.26	0.21
Sum	84,463.38	1,778.90	2,900.94	1,339.84
Sum Sq. Dev.	38,607,430.00	296.71	466.59	342.83
Observations	40	40	40	40

Table A-6
Descriptive Statistics: Stock Market Development Indicators (Quarterly, Q1 2003-Q4 2012)

	PS	MKTCAP	VALTRADE	TURNOVER
Mean	2,111.59	89.89	10.96	3.12
Median	2,352.69	94.08	11.54	3.28
Maximum	3,732.94	126.77	21.27	6.05
Minimum	585.41	51.17	1.48	0.70
Std. Dev.	994.95	19.77	5.53	1.43
Skewness	(0.30)	(0.35)	0.06	(0.09)
Kurtosis	1.69	2.43	2.05	1.91
Jarque-Bera	3.44	1.38	1.54	2.03
Probability	0.18	0.50	0.46	0.36
Sum	84,463.38	3,595.49	438.28	124.61
Sum Sq. Dev.	38,607,430.00	15,247.41	1,194.20	79.30
Observations	40	40	40	40

226

Table A-7
Principal Components Analysis: Financial Development Indicators
(Quarterly, Q1 2003-Q4 2012)

Sample: 2003Q1 2012Q4
Included observations: 40
Computed using: Ordinary correlations
Extracting 4 of 4 possible components

Eigenvalues: (Sum = 4, Average = 1)

Number	Value	Difference	Proportion	Cumulative Value	Cumulative Proportion
1	**2.63**	**1.60**	**0.66**	**2.63**	**0.66**
2	1.03	0.76	0.26	3.66	0.91
3	0.27	0.20	0.07	3.93	0.98
4	0.07	---	0.02	4.00	1.00

Eigenvectors (loadings):

Variable	PC 1	PC 2	PC 3	PC 4
PS	**0.59**	(0.12)	(0.42)	0.68
LIQLIAB	**0.55**	0.14	0.82	0.05
COMMBANK	**(0.53)**	(0.43)	0.39	0.62
BANKCRED	**(0.26)**	0.89	0.00	0.38

Ordinary correlations:

(prob in parentheses)	PS	LIQLIAB	COMMBANK	BANKCRED
PS	1.00			

LIQLIAB	0.74	1.00		
	-----	-----		
COMMBANK	(0.78)	(0.74)	1.00	
	0.00	*0.00*	-----	
BANKCRED	(0.49)	(0.25)	(0.01)	1.00
	0.001	*0.12*	*0.97*	-----

Table A-8
Principal Components Analysis: Financial Development Indicators
(Quarterly, Q1 2003-Q4 2007)

Sample: 2003Q1 2007Q4
Included observations: 20
Computed using: Ordinary correlations
Extracting 4 of 4 possible components

Eigenvalues: (Sum = 4, Average = 1)

Number	Value	Difference	Proportion	Cumulative Value	Cumulative Proportion
1	**2.58**	**1.50**	**0.64**	**2.58**	**0.64**
2	1.08	0.78	0.27	3.66	0.92
3	0.30	0.27	0.08	3.96	0.99
4	0.04	---	0.01	4.00	1.00

Eigenvectors (loadings):

Variable	PC 1	PC 2	PC 3	PC 4
PS	**0.61**	0.11	(0.10)	0.78
LIQLIAB	**0.55**	(0.18)	0.75	(0.31)
COMMBANK	**(0.28)**	0.82	0.47	0.16
BANKCRED	**(0.49)**	(0.53)	0.46	0.52

Ordinary correlations:

(prob in parentheses)	PS	LIQLIAB	COMMBANK	BANKCRED
PS	1.00			

LIQLIAB	0.82	1.00		
	0.00	-----		
COMMBANK	(0.35)	(0.45)	1.00	
	0.13	0.05	-----	
BANKCRED	(0.84)	(0.50)	(0.05)	1.00
	-	0.02	0.84	-----

228

Table A-9
Principal Components Analysis: Financial Development Indicators
(Quarterly, Q1 2009-Q4 2012)

Sample: 2009Q1 2012Q4
Included observations: 16
Computed using: Ordinary correlations
Extracting 4 of 4 possible components

Eigenvalues: (Sum = 4, Average = 1)

Number	Value	Difference	Proportion	Cumulative Value	Cumulative Proportion
1	**2.46**	**1.26**	**0.61**	**2.46**	**0.61**
2	1.20	0.95	0.30	3.66	0.91
3	0.25	0.15	0.06	3.91	0.98
4	0.09	---	0.02	4.00	1.00

Eigenvectors (loadings):

Variable	PC 1	PC 2	PC 3	PC 4
PS	**0.59**	(0.24)	(0.20)	0.74
LIQLIAB	**(0.01)**	0.89	(0.41)	0.19
COMMBANK	**(0.61)**	0.08	0.47	0.64
BANKCRED	**0.53**	0.37	0.75	(0.10)

Ordinary correlations:

(prob in parentheses)	PS	LIQLIAB	COMMBANK	BANKCRED
PS	1.00			

LIQLIAB	(0.24)	1.00		
	0.37	-----		
COMMBANK	(0.89)	0.06	1.00	
	0.00	*0.84*	-----	
BANKCRED	0.62	0.31	(0.67)	1.00
	0.01	*0.24*	*0.00*	-----

Table A-10
Principal Components Analysis: Stock Market Development Indicators
(Quarterly, Q1 2003-Q4 2012)

Sample: 2003Q1 2012Q4
Included observations: 40
Computed using: Ordinary correlations
Extracting 4 of 4 possible components

Eigenvalues: (Sum = 4, Average = 1)

Number	Value	Difference	Proportion	Cumulative Value	Cumulative Proportion
1	**2.78**	**1.86**	**0.70**	**2.78**	**0.70**
2	0.92	0.65	0.23	3.70	0.93
3	0.27	0.24	0.07	3.97	0.99
4	0.03	---	0.01	4.00	1.00

Eigenvectors (loadings):

Variable	PC 1	PC 2	PC 3	PC 4
PS	**0.53**	(0.17)	0.83	0.04
MKTCAP	**0.30**	0.90	(0.03)	0.32
VALTRADE	**0.58**	0.05	(0.33)	(0.74)
TURNOVER	**0.53**	(0.40)	(0.45)	0.59

Ordinary correlations:

(prob in parentheses)	PS	MKTCAP	VALTRADE	TURNOVER
PS	1.00			

MKTCAP	0.31	1.00		
	0.06	-----		
VALTRADE	0.79	0.53	1.00	
	0.00	*0.00*	-----	
TURNOVER	0.75	0.12	0.87	1.00
	0.00	*0.45*	*0.00*	-----

Table A-11

**Principal Components Analysis: Stock Market Development Indicators
(Quarterly, Q1 2003-Q4 2007)**

Sample: 2003Q1 2007Q4
Included observations: 20
Computed using: Ordinary correlations
Extracting 4 of 4 possible components

Eigenvalues: (Sum = 4, Average = 1)

Number	Value	Difference	Proportion	Cumulative Value	Cumulative Proportion
1	**3.49**	**3.17**	**0.87**	**3.49**	**0.87**
2	0.33	0.17	0.08	3.82	0.96
3	0.16	0.15	0.04	3.98	1.00
4	0.02	---	0.00	4.00	1.00

Eigenvectors (loadings):

Variable	PC 1	PC 2	PC 3	PC 4
PS	**0.50**	(0.05)	(0.86)	0.07
MKTCAP	**0.47**	0.84	0.23	0.13
VALTRADE	**0.52**	(0.24)	0.26	(0.77)
TURNOVER	**0.51**	(0.47)	0.37	0.62

Ordinary correlations:

(prob in parentheses)	PS	MKTCAP	VALTRADE	TURNOVER
PS	1.00			

MKTCAP	0.77	1.00		
	0.00	-----		
VALTRADE	0.89	0.79	1.00	
	-	-	-----	
	0.85	0.71	0.98	1.00
TURNOVER	*0.00*	*0.00*	*0.00*	-----

231

Table A-12
Principal Components Analysis: Stock Market Development Indicators
(Quarterly, Q1 2009-Q4 2012)

Sample: 2009Q1 2012Q4
Included observations: 16
Computed using: Ordinary correlations
Extracting 4 of 4 possible components

Eigenvalues: (Sum = 4, Average = 1)

Number	Value	Difference	Proportion	Cumulative Value	Cumulative Proportion
1	**2.21**	**0.85**	**0.55**	**2.21**	**0.55**
2	1.36	0.98	0.34	3.57	0.89
3	0.38	0.34	0.10	3.96	0.99
4	0.04	---	0.01	4.00	1.00

Eigenvectors (loadings):

Variable	PC 1	PC 2	PC 3	PC 4
PS	**0.45**	(0.51)	0.72	0.15
MKTCAP	**0.58**	(0.26)	(0.64)	0.43
VALTRADE	**0.63**	0.29	(0.04)	(0.73)
TURNOVER	**0.26**	0.77	0.27	0.52

Ordinary correlations:

(prob in parentheses)	PS	MKTCAP	VALTRADE	TURNOVER
PS	1.00			

MKTCAP	0.59	1.00		
	0.02	-----		
VALTRADE	0.41	0.69	1.00	
	0.11	*0.003*	-----	
TURNOVER	(0.19)	0.01	0.64	1.00
	0.49	*0.98*	*0.01*	-----

232

Table A-13

SEACEN Research Project: "Analytical Framework in Assessing Systemic Financial Market Infrastructure Draft Data Form

Name of Payment System (PS): Philippine Payment and Settlement System (PhilPaSS)

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Jan-Nov 2013	Average	Stdev	Pre 2008	Post 2008 (2009-2012)
No. of PS transactions	160,207	259,221	368,138	439,028	491,584	679,571	749,591	916,304	1,141,587	1,273,323	1,214,191	699,340	393,076	343,636	1,020,201
Value of PS transactions (in PHP billion)	33,237	33,637	53,921	121,977	187,127	223,011	188,482	206,613	312,606	349,641	325,368	185,056	114,943	85,980	264,336
PHP-USD (full-year average)	54.20	56.04	55.09	51.31	46.15	44.47	47.64	45.11	43.31	42.23	42.45	48.00	5.24	52.56	44.57
Value of PS transactions (in US$ billion)	613	600	979	2,377	4,055	5,014	3,957	4,580	7,217	8,280	7,665	4,122	2,795	1,725	6,008

Annual Market Price Value of transactions in USD (around 2008 crisis)

PS	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Jan-Nov 2013	Average	Std	Pre 2008	Post 2008
Money Market															
Repo (PHP million)	-	-	-	-	-	14,024.03	90,355.74	78,151.84	24,888.00	5,412.71	-	19,348.39	33,165.18	-	49,702.07
Repo (USD million)	-	-	-	-	-	315.33	1,896.75	1,732.49	574.61	128.18	-	464.73	736.77	-	1,083.00
FOREX Market															
PvP (PHP million)	368,067.65	5,485,817.50	11,438,826.05	19,660,370.07	27,439,201.61	30,064,427.46	32,946,312.37	37,824,099.10	34,593,274.13	33,587,407.47	30,552,887.17	23,996,608.23	12,824,449.14	12,878,856.58	34,737,773.27
PvP (USD million)	6,790.50	97,891.24	207,655.89	383,175.41	594,586.31	675,991.55	691,608.71	838,492.15	798,678.57	795,367.42	719,802.65	528,185.49	301,876.78	258,019.87	781,036.71
Bond Market (in USD million)															
DvP/eDvP: Government securities (PHP million)			83,599.07	1,038,567.45	1,681,353.24	1,909,527.85	1,851,261.18	2,321,004.28	5,097,009.77	3,955,157.70	5,296,857.91	2,323,433.85	1,887,653.50	700,879.94	3,306,108.23
DVP (USD million)			1,517.62	20,239.35	36,433.63	42,935.28	38,861.66	51,452.48	117,678.15	93,660.21	124,789.92	52,756.83	44,845.96	14,547.65	75,413.12

233

Figure B-1
Financial Development Indicators vs Payment System Transactions
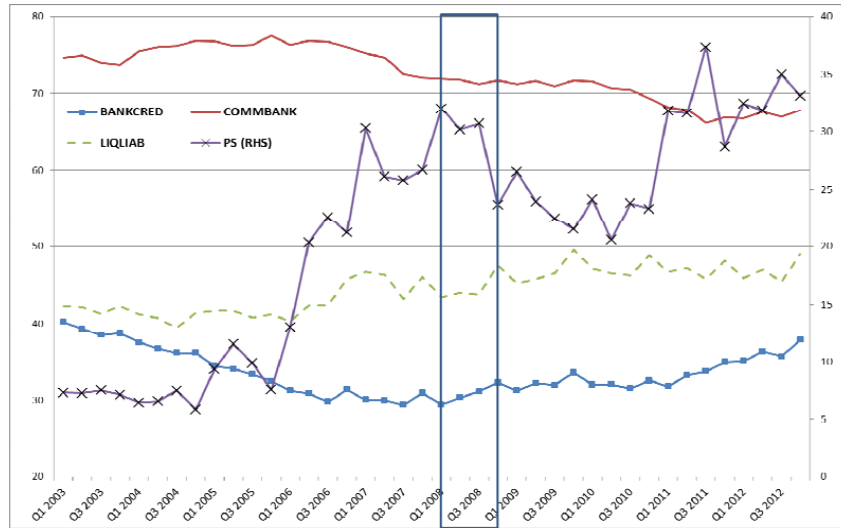

Figure B-2
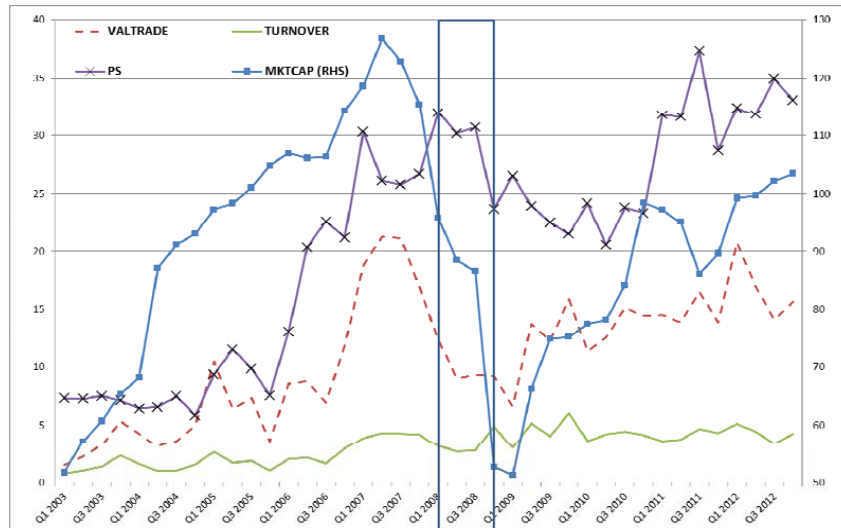**Stock Market Development Indicators vs Payment System Transactions**

234

Figure B-3
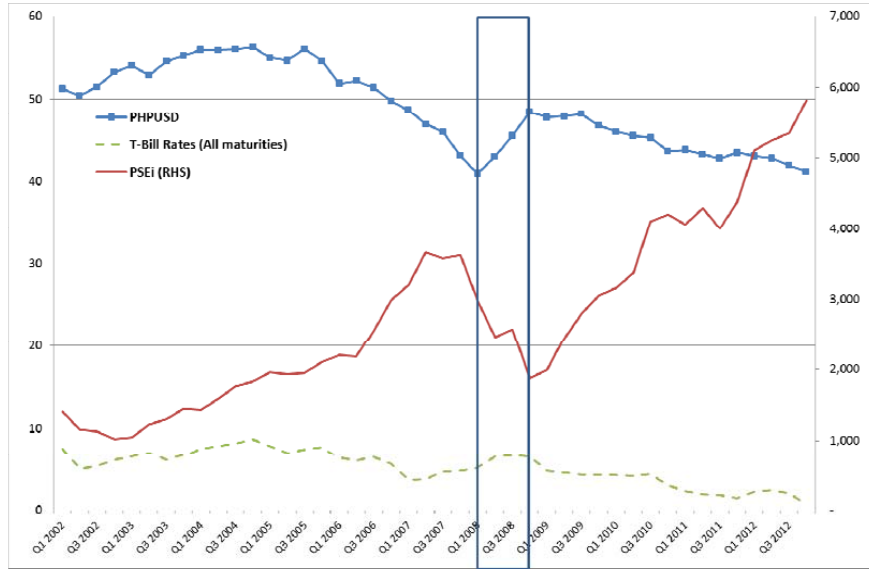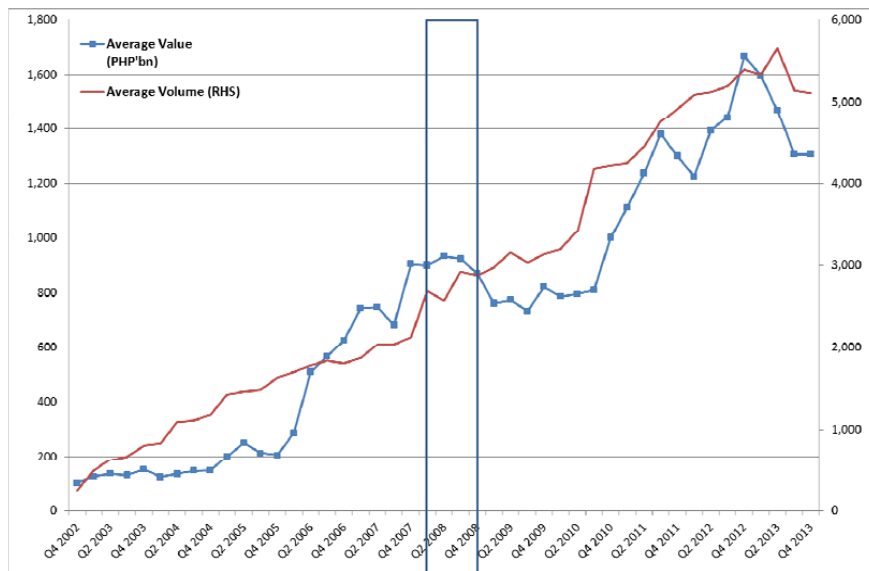**Asset Prices, 2002-2012**

Figure B-4
Average Daily Value and Average Daily Volume
of Payment System Transactions,
2002 -November 2013

235

Chapter 8

ANALYTICAL FRAMEWORK IN ASSESSING SYSTEMIC FINANCIAL MARKET INFRASTRUCTURE – SRI LANKA

By
K. M. A. N. Daulagala[1]

1. Introduction

1.1 General Motivation

Financial Market Infrastructure (FMI) is a crucial component of a country's financial system enabling financial intermediation that is necessary for growth and development of the country's economy. FMIs constitute payment systems (PSs), central depository systems (CDSs), securities settlement systems (SSSs), central counterparties (CCPs) and trade repositories (TRs) which provide the underlying foundation for financial market transactions. Hence, in order to ensure stability in the financial system, it is important that the FMIs play their role of facilitating a secure, safe and reliable medium for financial transactions, effectively and efficiently. With the evolution of increasingly interconnected financial markets with increased level of cross-border transactions, the interdependencies between domestic as well as cross-border FMIs have magnified. Therefore, the safety and security of one system is often dependent upon the safety and security of other connected systems.

The purpose of the study is to assess the domestic and cross-border interdependencies of a systemically important FMI in Sri Lanka, namely, the Real-time Gross Settlement (RTGS) System in order to assess the contagion effects and possible systemic risks that can manifest from domestic or external shocks causing instability in the country's financial system. The effects of the global financial crisis (GFC) of 2008 will be analysed to assess the transmission of risks to financial markets and the RTGS from an external shock. The economic slowdown in 2012 resulting from extreme weather conditions which exerted upward pressure on prices amidst rapid monetary expansion and widening trade deficit will be analysed as an internal shock. In doing so, it is intended to develop

an analytical framework to assess the interdependencies and contagion effects of systemic FMIs and to make suitable recommendations to ensure that such systemic risks are mitigated.

1.2 General Information on Sri Lanka

Known until 1972 as Ceylon, Sri Lanka is officially known as the Democratic Socialist Republic of Sri Lanka. It is an island state in the northern Indian Ocean off the southern coast of the Indian subcontinent in South Asia. It has a population of 20 million, and a labour force consisting of 41% of the population. The unemployment rate in 2012 was 4%.

Table 1
Stylised Statistics of Sri Lanka

Economy (GDP) in 2012	US$ 59.42 billion
Population	20 million (mid-year 2012)
Area	65,610 Square Kilometres
Geographical Type	Island
Capital Account	Partially liberalised
External Integration (2012) = (Exports +Imports) / GDP	48.68%
Financial Development (2012) = Total credit to private sector by deposit taking institutions / GDP	41.5%
Payment System Total Transactions (RTGS) 2012 as a % of GDP	570%

The overall macroeconomic situation in Sri Lanka has changed dramatically over the recent years. With the 30-year internal conflict ending in May 2009, the country progressed to the status of a middle-income country in 2010. Even during the war, Sri Lanka was able to maintain an annual average growth of about 5%. However, the growth declined to 3.5% in 2009 while the war was entering its final stages and further exacerbated by the spill-over effects of the global financial crisis. The post-conflict rebound spurred private sector demand, enabling Sri Lanka to record impressive growth rates of 8.0% and 8.4% in 2010 and 2011, respectively, with Sri Lanka posting the fastest growth rate in South Asia in 2011. During the past 10 years, the per capita income tripled from US$ 981 (2003) to US$ 2,923 (2012). Inflation remained in the single digits for almost five consecutive years recording an annual average of 8% as at end August 2013. With the expansion of economic activities, the unemployment rate steadily declined from 7.6% in 2000 to 4% in 2012. Fiscal consolidation enabled contraction of the fiscal deficit since 2009 from 9.9% of GDP to 6.4% of GDP in 2012. Sri Lanka continues to maintain an impeccable debt repayment record with the debt- to-GDP ratio declining from above 100% in 2002 to 79 % in 2012.

The extreme weather conditions that prevailed in 2012 amidst the domestic economic challenges led to the slowdown of economic growth from above 8% in the 2010 and 2011 to 6.4% in 2012. High credit and monetary expansion along with widening trade deficit, fuelled by high import demand and the unfavourable weather conditions disrupting agricultural output and significantly reducing hydro power generation, had a negative impact on value addition while exerting pressure on prices. A comprehensive policy package, including monetary policy tightening, macro-prudential measures, such as imposition of a ceiling on bank credit growth, provision of greater flexibility in exchange rates, raising of tariffs on selected imports as well as adjustments to administratively determined prices, specifically those relating to energy, were implemented to contain the overheating of the economy.

With regard to the external sector, the gross official reserves have increased threefold over the past ten years posting a total of US$ 6.9 billion by end December 2012, which is equivalent to 4.4 months of imports. Upgrading of the country's sovereign credit rating by the international rating agencies, relaxation of restrictions on foreign exchange transactions and the successful completion of the IMF's Stand-By Arrangement of SDR 1.7 billion in July 2012, have buoyed investor confidence in the country, resulting in a steady increase in foreign capital inflows into the capital markets and various projects, specifically in infrastructure development. Moreover, earnings from tourism, worker remittances and FDIs have steadily increased over the years.

Since January 2001, Sri Lanka has been operating a floating/flexible exchange rate regime where the exchange rates are determined by market forces. The current account liberalisation commenced in November 1977 with the declaration of open economic policies by the government and the exchange rate regime moving from 'fixed' to a 'managed floating' or 'crawling peg' system. At present foreign exchange transactions in the current account are free. Currently, external integration in terms of total exports and imports amount to 49% of GDP.

Liberalisation of the capital account transactions has been slow, although several measures have been taken in this respect over the years. At present, foreign capital inflows, such as investments in corporate equity, Unit Trusts, government securities and foreign direct investments are largely free, while licensed banks are permitted deposit taking and lending in foreign currency under specified schemes. Other capital transactions fall within the control where prior approval is needed.

The key macroeconomic indicators of Sri Lanka are presented in Appendix 1.

1.3 Effect of 2008 Global Financial Crisis (GFC) on Sri Lanka's Economy and FMIs

As the GFC unfolded in 2008, the external and the real sectors of the Sri Lanka's economy were affected significantly. The outflow of foreign capital, coupled with declined inflows and reduced demand for exports, exerted tremendous pressure on the exchange rate while the external official reserves declined by about 50%. The BOP surplus at the beginning of the year turned to a deficit of US$ 1.2 billion by end-2008 and inflation rose to its highest levels since the 1980s. The GDP growth declined from 6.8% in 2007 to 6.00% in 2008 and to 3.5% in 2009. Hence, the impact of the GFC on the economy of Sri Lanka, specifically the external sector, was significant.

Due to the fact that the capital account had not been fully liberalised and that many local banks did not trade in complex foreign currency financial instruments, the direct impact of the GFC on the country's financial institutions and financial markets was not very significant. Hence, there was no significant effect of the GFC on the FMIs in Sri Lanka.

1.4 Outline of the Team Project Paper

This team project paper for Sri Lanka forms part of the SEACEN's Research Project on Analytical Framework in Assessing Systemic Financial Market Infrastructure. Section 1 presents the objective of the study and an introduction to Sri Lanka and its economy. It also briefly indicates the impact of the GFC on the country's economy, the financial sector and its FMIs. Section 2 provides a detailed description of the country's FMIs, identifying the interdependencies of the FMIs within the economy and the oversight and supervisory function with respect to each of the FMIs. Section 3 presents an analysis of the financial statistics relating to the economy and the FMIs, and Section 4 deals with the empirical analysis of the interdependencies of the FMIs. Section 5 concludes the study with recommendations for the mitigation of the systemic risks arising from interdependencies between the FMIs within the country as well as with the FMIs outside.

2. FMIs in Sri Lanka

2.1 Stylised facts of FMIs in Sri Lanka

The FMIs in Sri Lanka fall within the four categories of PSs, Central Securities Depositories (CSDs), SSSs and TRs. Currently, there is no CCP System in Sri Lanka although plans are being formulated to establish a CCP for equity, corporate debt and secondary market transactions of government securities. The three main operators of the FMIs in Sri Lanka are the Central Bank of Sri Lanka (CBSL), LankaClear (Pvt) Ltd. (LCPL) and the Colombo Stock Exchange (CSE).

LankaSettle is owned and operated by the CBSL and comprises two components; the RTGS System which is the fund settlement component and LankaSecure, which is the securities settlement component for government securities. LankaSecure consists of the Scripless Securities Settlement System (SSSS) and the Scripless Securities Depository System (SSDS) for scripless government securities. The RTGS system was launched by the CBSL in September 2003, and the integrated RTGS, SSSs and the SSDS for scripless government securities went live on 3 February, 2004.

The retail payment system, of which the main components were the cheque clearing system and the Sri Lanka Interbank Payment System (SLIPS), were owned and operated by the CBSL before they were divested in April 2002 to a newly formed company, the LCPL. The LCPL was jointly owned by the CBSL and licensed commercial banks. In October 2002, the LCPL launched the US$ cheque clearing system as well as a local draft clearing system. In order to shorten the cheque clearing cycle, the LCPL, with the assistance of the CBSL, introduced the Cheque Imaging and Truncation System (CITS) in May, 2006.

The CSE operates the Automated Trading System (ATS) which was launched in 1997 for listed equity transactions, while the Central Depository Pvt Ltd., a fully owned subsidiary of the CSE, operates the CDS for scripless equity and corporate debt. The CSE also has a Debt Securities Settlement System (DEX) for the trading of corporate debt securities. The CSE is regulated by the Securities Exchange Commission (SEC) of Sri Lanka.

The RTGS and CITS together account for around 99% of the total value of the non-cash payments in the country and both are therefore considered as systemically important payment systems (SIPSs). Other non-cash payments are made through SLIPS, card-based payment mechanisms, drafts, postal instruments

and other electronic modes of payment, such as phone, mobile, telebanking and internet banking. The RTGS which handles large-value payments accounted for 86% of the total value of non-cash transactions (or 576% of GDP) in 2012. However, in terms of the number of transactions, it amounted to only 0.45% of the total. On the other hand, the CITS accounted for 13% of the value of non-cash transactions (or 88% of GDP) in 2012, whereas volume-wise it accounted for almost 77%.

All fund transactions that are settled through the payment systems, i.e., RTGS, SLIPS and CITS are rupee transactions and none of these systems have direct links to the external FMIs. For purposes of messaging payment instructions, the RTGS has connectivity to the SWIFT system. Foreign currency transactions are settled through the licensed commercial banks (LCBs) which have foreign currency accounts with correspondent banks overseas.

Table 2
Type of Major FMIs in Sri Lanka and Their Operators

SN	FMI Type		FMIs Operated by		
			CBSL	LPCL	CSE
1	Payment System		RTGS	CITS, SLIPS	
2	Capital Market Related FMIs	CSD	SSDS		CDS
3		SSS	SSSS		DEX
4		CCP			
5		TR			ATS

2.2 General Policy and Regulation Framework for FMIs in Sri Lanka

There are two regulatory authorities with responsibilities for regulating and supervising FMIs in Sri Lanka, i.e., the CBSL and the SEC. The CBSL is empowered by the Monetary Law Act No. 58 of 1949 (MLA) to issue licences, regulate and supervise all major financial institutions, which include LCBs, licensed specialised banks (LSBs), licensed finance companies (LFCs), finance leasing establishments and primary dealers (PDs) in government securities. The SEC is responsible for licensing and regulation of the stock exchanges (i.e., the CSE), stock brokers, stock dealers, unit trusts and credit rating agencies. The CSE issues the rules governing the operations of ATS, CDS and the DEX system to its participants. All participants are licensed by the SEC.

Under the MLA, the CBSL is vested with the authority of providing payment services to the banking system. In 2002, to facilitate payment reforms, the MLA was amended empowering the CBSL with the responsibility for administration, supervision and regulating monetary services and financial payment systems in Sri Lanka.

The Payment and Settlement System Act No 28 of 2005 (PSSA) was enacted to provide the CBSL with wider powers to formulate, adopt and monitor the implementation of payment system policy for Sri Lanka, primarily to facilitate the overall stability of the financial system, promote safety and efficiency of the payment system and to control risk. The PSSA also governs the payment, clearing and settlement systems and provides the CBSL with oversight and regulatory powers over payment and settlement systems. The CBSL also has the responsibility for operating the SIPSs, formulating the national payments policy and further development of the payment systems. The CBSL has issued several regulations, directions and guidelines under the PSSA to the participating institutions.

The CBSL as the operator of the RTGS provides an intraday liquidity facility (ILF) to the participants of the RTGS. Provided the participants pledge collateral as prescribed, they can obtain liquidity at any time at the required quantities.

In addition to the above, there are several other laws that govern the various aspects of the payment and settlement system (PSS). The Bills of Exchange Ordinance, No 25 of 1927 provides for matters relating to bills of exchange, cheques, banker's draft and promissory notes. The Banking Act, No 30 of 1988 establishes licensing requirements for the LCBs and LSBs, prudential requirements, prudential supervision, accounting and disclosure requirements and procedures relating to dealing with problem banks and winding up of banks. The Local Treasury Bills Ordinance (LTBO) and the Registered Stock and Securities Ordinance (RSSO) provide the necessary legal provisions for the issuance of government securities and issuance of government securities in scripless form and linking of the settlement system to the RTGS system to enable securities settlement on a delivery-vs.-payment (DvP) basis. The Payment Devices Frauds Act, No. 30 of 2006 provides the measures to deter illegal and hazardous practices relating to payment devices. The Electronic Transactions Act, No. 19 of 2006 recognises and facilitates the formation of contracts, creation and exchange of data messages, documents and records and other communications in electronic form in Sri Lanka.

The National Payments Council (NPC) is the highest decision making body with regard to the country's payment systems. The NPC is chaired by a Deputy Governor of the CBSL and is represented by the banks, LCPL, CSE and the Ministry of Finance (MOF). The NPC has played a major role in the payment reforms over the past years and continues to formulate road maps and define milestones to be achieved in the payment infrastructure in the country.

2.3 Mapping of Interdependencies of FMIs in Sri Lanka

The RTGS system, which is the large-value payment system (LVPS) in Sri Lanka, is the SIPS in terms of the value of transactions settled. The funds settled through the RTGS relates to the transactions from all the markets, i.e., Money, Bond, Forex and Securities markets. In addition to the RTGS, other FMIs are also involved in several financial markets performing a variety of functions. The FMIs involved in the multiple markets are identified in Table 3 below.

Table 3
FMIs Involvement in Different Markets

FMIs			Market				
			Money Market- Call Money, T bills, repo, rev repo etc.	Bond Market – T bonds	Bond Market- T-bonds, Corporate debt	Forex Market	Securities Market - equity
Payment Systems		RTGS	X	X	X	X	X
		CITS	X	X	X	X	X
		SLIPS	X	X	X	X	X
Capital Market FMIs	CSD	SSDS	X	X			
		CDS			X		X
	SSS	SSSS	X	X			
		DEX			X		
	TR	ATS					X

The interdependencies of PSSs can be described in three forms, namely: (i) system-based interdependence; (ii) institution-based interdependence; and (iii) environmental interdependence.

2.3.1   System-based Interdependencies

System-based interdependencies are the direct links between two FMIs. Within the system- based interdependencies, there are two types, vertical and horizontal interdependencies.

2.3.1.1   Vertical Interdependencies between FMIs

Since the RTGS system settles transactions of several markets it has vertical linkages to several other FMIs such as SSSs, CDs and SSDS.

### 2.3.1.2 *Horizontal Interdependencies between FMIs*

The other two payments systems in Sri Lanka, the CITS and SLIPS, have multilateral net settlement (MLNS) arrangements with the RTGS where the settlement of batches of transactions is done on net basis. The SLIPS has two settlements per day and the CITS has one settlement a day that gets settled through the RTGS. Value-wise the MLNS account for about 4-5% of the total RTGS settlements while on the basis of number of transactions it amounts to about 8-10% of the total RTGS settlements.

The mapping of the vertical and horizontal interdependencies of the RTGS is depicted in Chart 1 below, while the interdependencies within each market, i.e., the Money and Bond, Forex and Equity markets, are presented in Appendix 2.

2.3.2 *Institution-based Interdependencies*

Currently there are altogether 34 institutions that are direct participants of the RTGS, namely, the CBSL, 33 LCBs and 7 PDs. The LCBs act as custodian banks or settlement banks.

Chart 1
Interdependencies of FMIs in Sri Lanka
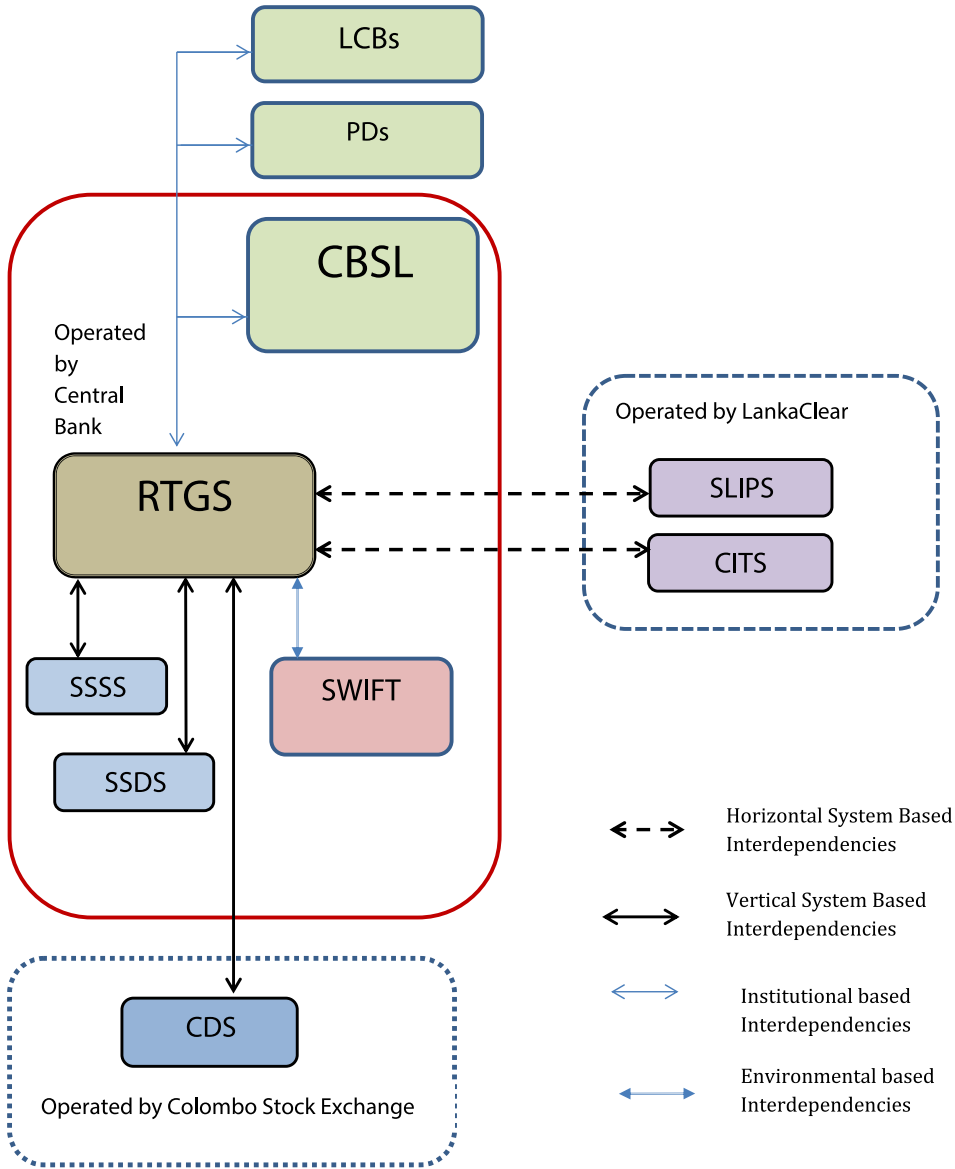
2.3.3   Environment-based Interdependencies

The RTGS has connectivity to the SWIFT network and its FIN Y-Copy service through which payment instructions are transmitted between the RTGS and its participants. Hence, all the participants of the RTGS also have connectivity to the SWIFT network.

2.4 Oversight and Supervisory Authorities of FMIs in Sri Lanka

The ownership as well as the oversight and supervisory authority of the FMIs fall under public as well as private institutions. The institutions as well as their oversight responsibilities are identified in Table 4 below.

Table 4
Oversight and Supervisory Responsibilities of FMIs

FMI Type	PAYMENT SYSTEMS	
Ownership	Public	Private
FMI	**RTGS**	**SLIPS, CITS**
Authorisation, designation or licensing	*CBSL appoints participants. Required to sign 4 agreements with the Monetary Board of CBSL*	*LCPL issues operational guidelines to participants (including those for Business Contingency Plan (BCP) and Disaster Recovery Site (DRS) requirements). Participants are appointed with approval of CBSL.*
Oversight by CBSL	*Agreements with participants, issues system rules for operation, Issues guidelines on BCP and DRS*	*Issued general direction to PI and LCPL, issues regulations and guidelines, conducts oversight for compliance with laws*
Supervision by other Government Agencies	*No*	*No*
Onsite inspection	*Yes – for frauds, malpractices (by CBSL's Bank Supervision Dept.)*	*Yes – for system compliances (by CBSL's Payments and Settlement Dept.)*
FMI Type	**SETTLEMENT SYSTEMS**	
Ownership	Public	Private
FMI	**SSSS**	**ATS, DEX**
Authorisation, designation or licensing	*CBSL appoints participants*	*SEC licenses participants CSE issues system rules and guidelines*
Oversight by CBSL	*Issues system rules, requirements for BCP and DR sites*	*No. But Deputy Governor on the board of SEC.*
Supervision by other Government Agencies	*No*	*No*
Onsite inspection	*No*	*No*
FMI Type	**CDS**	
Ownership	Public	Private
FMI	**SSDS (Government Securities)**	**CDS (Equity and Corporate debt)**
Authorisation, designation or licensing	*CBSL appoints participants*	*SEC licenses participants CSE issues system rules*
Oversight by CBSL	*Issues system rules*	*No. But Deputy Governor on the board of SEC*
Supervision by other Government Agencies	*No*	*No*
Onsite inspection	*Yes*	*Yes*

3. Financial Statistics

Effective and efficient FMIs are key elements for an economy's financial activities that support its growth trajectory. The intermediation function for financial activities is provided by the financial institutions, while financial markets facilitate the sourcing of funds required for economic activities. Since financial institutions and financial markets are closely interlinked with the FMIs, it is important to understand the extent of the interconnections between the FMIs with the financial sector to make an assessment of the potential risks to FMIs. Hence, this section analyses a selected systemically important FMI of Sri Lanka and its links with the financial sector.

In Sri Lanka the most systemically important FMIs are the RTGS and SSSS, in terms of the value of transactions settled through these systems. In 2012, the value of funds settled through the RTGS amounted to 576 % of GDP, while the value of securities settled through SSSS was 472% of GDP. Comparing the payment systems, the number of transactions settled through the CITS is 48 million while it was only 0.3 million through the RTGS. However, value-wise the RTGS has settled an equivalent of US$ 340 billion of transactions as against US$ 55 billion of CITS. Moreover, taking into consideration the involvement of the FMIs in multiple markets, RTGS settled transactions arising from all markets while the next largest FMI, the SSSS settles only government securities. Hence for the purpose of this study, RTGS is selected as the systemically important FMI, which is interconnected with several other markets and systems.

Table 5
Transaction Volumes of FMIs during 2012

FMIs				No of Transactions / Outstanding Volume	Total Value of Transactions US$ million	% of GDP
Payment Systems	RTGS			284,561	340,1l0	576
	CITS			47.8 mn	54,840	88
	SLIPS			14 mn	4,349	7
Capital Market FMIs	CSD	SSDS	(Outstanding Volume in Custody)	ISINs 139	25,202	42
		CDS		Equity 67 bn	15,405	25
				Debt 324 mn	267	0.4
	SSS	SSSS		574,577	278,700	472
		DEX		41	0.6	0.001
	TR	ATS		9691.2 mn	1,680	3

248

The detailed transaction values and volumes of the payment systems in 2012 are at Appendix 3. The transaction details of the capital-market-related FMIs are at Appendix 4.

3.1 Systemically Important Payment System - RTGS

Sri Lanka was the first country in South Asia to introduce RTGS for large-value and time -critical payment obligations. As at end-2012, the RTGS accounted for settling 89% of the total non-cash payments (value-wise), such as rupee payments relating to interbank call money market, government securities market, foreign exchange market (rupee leg), open market operations and time-critical third-party (customer) transactions. The RTGS is connected to the SWIFT network to support exchange of payment instructions and ensure high security of transactions while in transmission.

3.1.1   Participants in the RTGS

The CBSL as the operator of the RTGS has the mandate to appoint the participants giving them the facility to maintain a settlement account with the CBSL, provided that they satisfy the requirements for participation in the RTGS system. While the CBSL itself is a direct participant, as at end-2012, there were 33 direct participants in the RTGS, of which 12 were local commercial banks, 12 were foreign commercial banks and 7 were PDs. In addition, the Employees Provident Fund (EPF), the largest superannuation fund managed by the CBSL, and the CDS of the CSE are also participants in the RTGS.
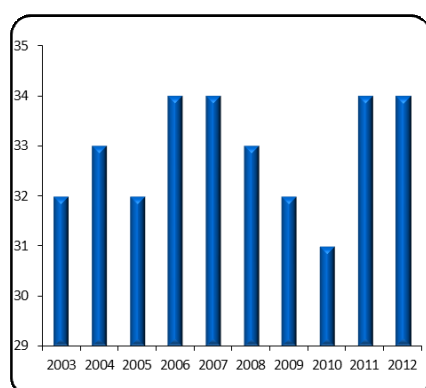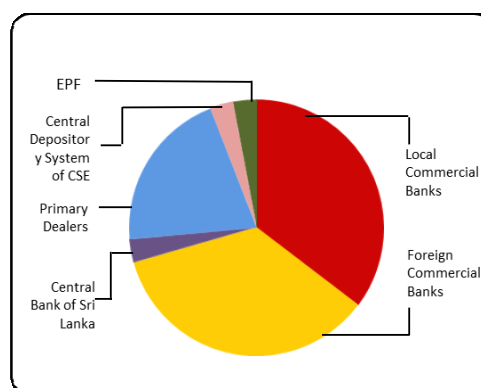
Chart 2
Total Number of Participants

Chart 3
Types of Participants in RTGS 2012

The participants of the RTGS are involved in the transactions relating to the multiple markets. All the participants are at least active in two markets as depicted below. 26% of the participants (PDs, CDS, EPF) are active in two markets, the CBSL (3% of participants) is active in 3 markets, while 71% of the participants (LCBs) are active in all four markets.

Table 6
Participation in Multiple Markets

No. of Participants		Markets			
		Money	Forex	Bond	Securities
Direct Linked	CBSL	1	1	1	
Indirect Linked	LCBs	24	24	24	24
	PDs	7		7	
	CDS			1	1
	EPD			1	1
	Total	32	25	34	26

Participants of Multiple markets

|			
Participants in two markets		9	26%
Participants in three markets		1	3%
Participants in four markets		24	71%
Total no. of Participants		**34**	**100%**

3.1.2 Volume of Transaction in the RTGS

The RTGS settles rupee transactions between the direct participants provided that the payer's and payee's settlement accounts are neither suspended nor defaulted and the payer's account has sufficient balance. These transactions can be broadly categorised into the following:

- General credit transfers: these are payments among the participants regarding call money, securities transactions, etc.

- Transactions with the CBSL: these are payments for which one of the parties is the CBSL. Open market operations, cash delivery to and from LCBs, the rupee leg of foreign exchange transactions and government securities transactions, granting and repayment of ILF, etc.

- Multilateral net settlement balances: these are net positions of the LankaClear cheque clearing system and SLIPS sent by the LankaClear.

- Customer payments: any other high-value and time-critical payment sent to the RTGS by a participant on behalf of a customer.

The transaction volumes of the RTGS have increased over the years gradually with the average transactions per day also increasing steadily.

Chart 4
Number of Annual Transactions and Average Transactions per Day
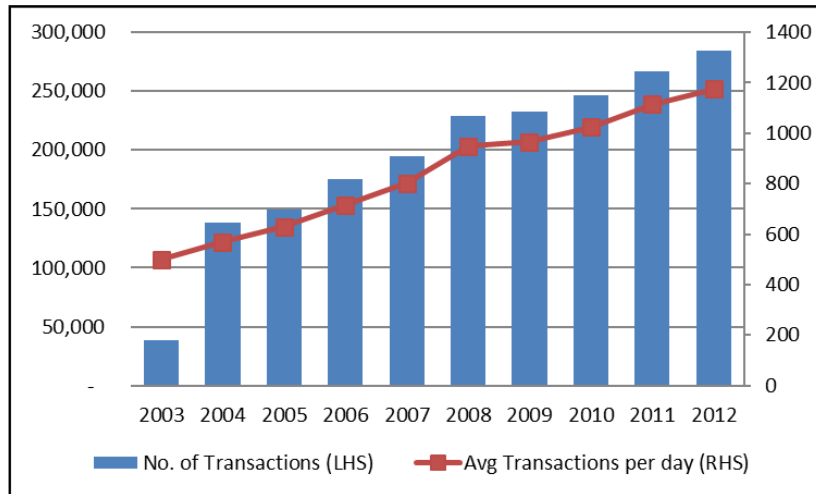
3.1.3 Value of Transactions in the RTGS

Although the transaction volumes have increased gradually over the years, the value of the RTGS transactions have significantly increased in 2009 to 2011, while there is a marked decline in 2012 (Chart 5). The significant increase in value has come from the category of repos and reverse repos (Chart 6) carried out by the CBSL and commercial banks (Chart 7).

Chart 5
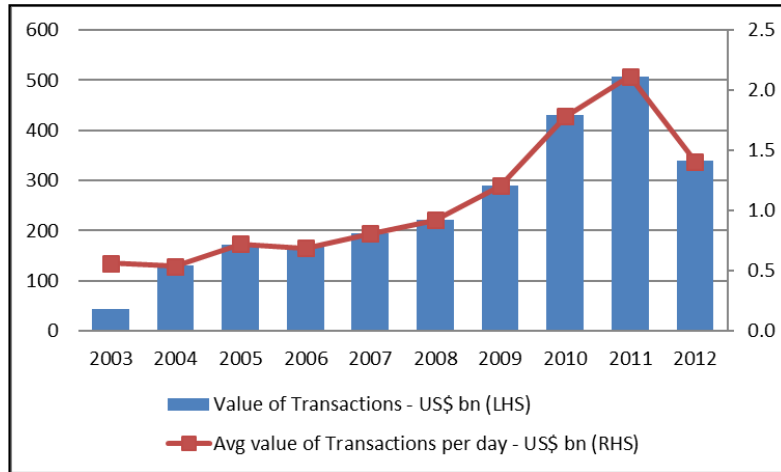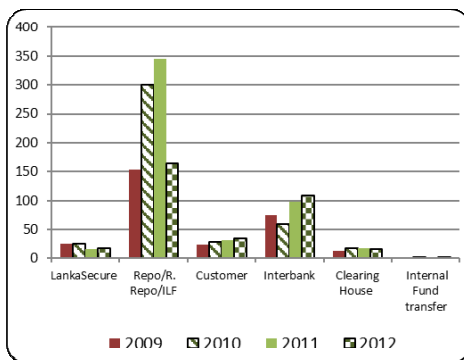**Value of Annual Transactions and Average Transactions per Day**

Value of Transactions - US$ bn (LHS)
Avg value of Transactions per day - US$ bn (RHS)

Chart 6
RTGS Values
by Transaction

■ 2009 ▨ 2010 ▨ 2011 ▨ 2012

Chart 7
Type of RTGS Values by
Participant

■ 2009 ▨ 2010 ▨ 2011 ▨ 2012
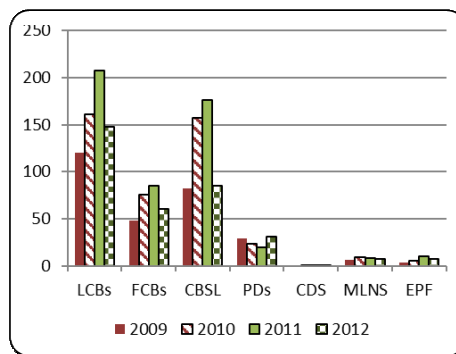
Following the turnaround in deficit rupee liquidity in the domestic money market from mid- 2009, the money market liquidity continued to be in excess in 2010 and 2011. The build-up of excess liquidity in 2010 was largely due to the absorption of foreign exchange inflows into the country by the CBSL with a view of preventing undue appreciation of the rupee. The proceeds of the sovereign bond of US$ 1 billion in October 2010 to international investors, foreign investments in Treasury bonds and Treasury bills and other foreign currency inflows to both government and private sector resulted in excess foreign exchange

252

in the domestic foreign exchange market in 2010, which had to be absorbed, releasing rupee liquidity to the market. In order to stabilise interest rates and to guide reserve money along the targeted path, the CBSL took several measures to absorb the excess rupee liquidity. The sale of government securities held by the CBSL, overnight and term repos, issue of Central Bank securities on overnight and term basis and foreign exchange swaps were some of the measures carried out to absorb the excess liquidity in 2010 (Chart 8).

Chart 8
Total Market Rupee Liquidity
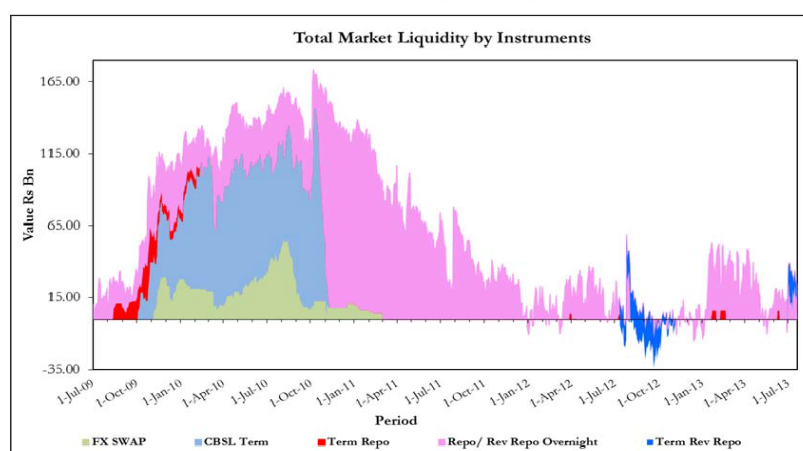
The purchase of Treasury bills by the CBSL, the conversion of part of the US$ 1 billion sovereign bond issued in 2011 to rupees contributed largely to the continued excess liquidity during 2011. However, the net sale of foreign exchange to the market to contain the pressure on the exchange rate resulting from a widening trade deficit, the upward revision of the SRR and the overnight repos were used to reduce excess liquidity by the end of the year.

The increased transaction values in the RTGS in 2010 and 2011 can be explained by the measures taken by the CBSL to curtail excess liquidity by way of repos and transactions in foreign exchange and government securities. Moreover, the suspension of term repos in 2010 led to overnight repos being transacted in very large volumes and frequencies.

3.1.4 Market Share of the 5 Largest Senders of Payment Messages

In 2012, the largest participant in the RTGS was the CBSL while the two state banks followed in 2nd and 3rd positions. The CBSL's volumes are high since it is a party to a large volume of open market operations through repos and reverse repos, foreign exchange swaps and exchange rate policy measures, such as purchase and sale of foreign exchange of which the rupee leg is transacted through the RTGS, provision of the ILF which accounted for about Rs 10 billion (US$ 79 million) on average in 2012. Further, the CBSL carries out its foreign currency interventions mainly through the two state banks, which are also the largest banks in the country.

Chart 9
Market Share of Largest 5 Participants in RTGS in 2012
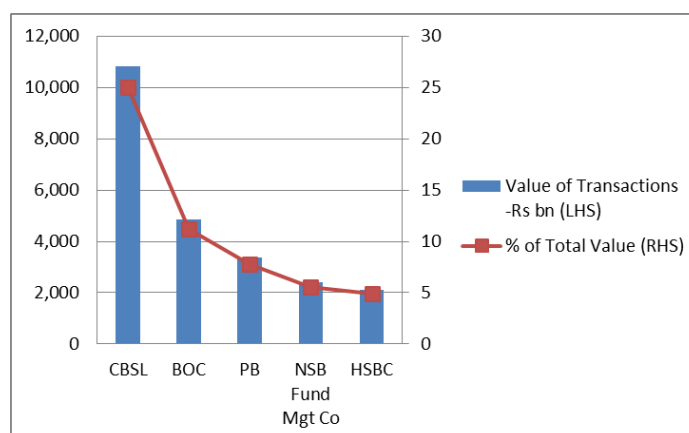
3.2 Financial Market Statistics

3.2.1 Money Market

The money market, which consists of call money, Treasury bills, commercial paper, repo and reverse repos, is the largest financial market in the country in terms of value of annual transactions. From 2003 to 2009, call money and repos together accounted for about 78% or US$ 30 billion on average annually of the total money market transactions. However, in 2010 and 2011 the repo activities increased significantly to US$ 97 billion and US$ 127 billion, accounting for 84% and 80% of the total annual money market transactions, respectively, as a result of the CBSL's use of various instruments to absorb excess rupee liquidity in the domestic market (Chart 10). As the excess liquidity was completely contained towards 2012, the repo activity declined significantly (Chart 8) in 2012.

254

Chart 10
Volume of Annual Transactions in Financial Markets (US$ billion)
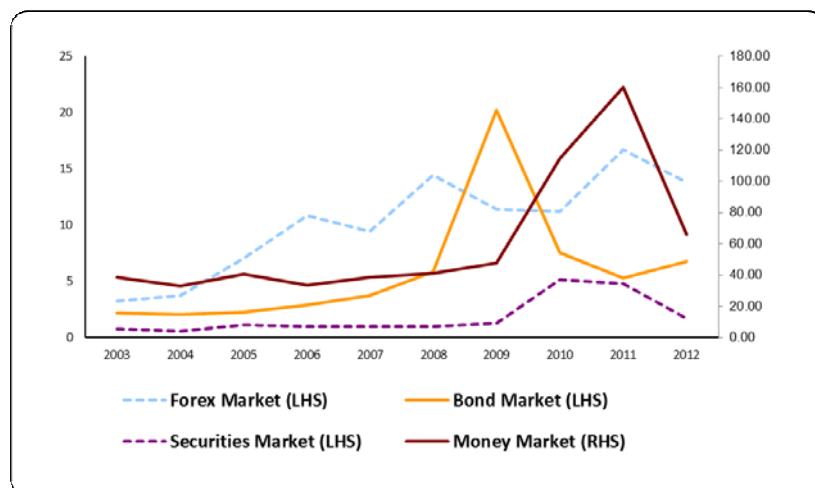
3.2.2 Forex Market

The transactions in the forex market include tom, spot, cash, spot next and forward transactions in foreign currency against the Sri Lanka rupee. With increased foreign currency inflows into the country by way of foreign direct investments, inward private remittances, proceeds of international bond issues and increase in exports, activity in the forex market has increased over the years (Chart 10). There were significant increases in interbank forex activities in 2008 and 2011. In 2008, with the GFC unfolding, there was significant outflow of foreign funds from the market, creating tight liquidity conditions in the domestic forex market. Moreover, with demand for foreign funds from importers exerting pressure on the exchange rate, the CBSL intervened with US$ 2.2 billion into the market to stabilise the exchange rate. In 2011, the interbank forex transactions increased to US$ 16 billion (from US$ 11 billion in 2010) with the central bank interventions amounting to US$ 3.5 billion in the forex market to contain excessive volatility in the market.

3.2.3 Bond Market

The bond market is dominated by Treasury bonds, while there are Central Bank Securities (currently not in issue) and corporate debt securities. Investor confidence in Sri Lanka was buoyed by the IMF commencing its Stand-by Arrangement (SBA) programme in 2009. With the increase in the limit of foreign

255

investments in government securities from 10% to 12.5%, the foreign funds into the Treasury bond market increased significantly in 2009. As the limits were fully utilised, new investments in bonds were not significant in the subsequent years. However, with the developments in the corporate debt market, issuances of corporate debentures have increased in the recent years.

3.2.4 Securities Market

The market capitalisation of the Sri Lanka's equity market is currently 29% of GDP or US$ 18 billion. The equity market saw its market capitalisation doubling in 2009 and 2010 supported by positive sentiments arising after end of the war. The sharp decline in inflation and lower interest rate environment buoyed investor sentiment in the equity market which was reflected in several Initial Public Offerings (IPOs) and rights issues successfully concluded during these years.

3.3 Financial Related Development Indicators

Table 7
Development Indicators for Sri Lanka

Year	Financial Development Indicators			Stock Market Development Indicators		
	Liqlab	Commbank	Bankcred	Makt Cap	ValTrade	Turnover
2002	0.31	0.72	0.35	0.10	0.02	0.19
2003	0.32	0.71	0.36	0.14	0.04	0.28
2004	0.33	0.71	0.39	0.18	0.03	0.15
2005	0.34	0.74	0.40	0.24	0.05	0.20
2006	0.34	0.76	0.42	0.28	0.04	0.13
2007	0.32	0.76	0.41	0.23	0.03	0.13
2008	0.29	0.77	0.36	0.11	0.03	0.23
2009	0.32	0.73	0.32	0.23	0.03	0.13
2010	0.32	0.72	0.34	0.39	0.10	0.26
2011	0.34	0.73	0.40	0.34	0.08	0.25
2012	0.34	0.75	0.41	0.29	0.03	0.10
Average	**0.32**	**0.74**	**0.38**	**0.23**	**0.04**	**0.18**

3.3.1 Financial Development Indicators

Liqliab: M2 / nominal GDP
Commbank: Total assets of commercial banks / sum of commercial bank and central bank assets
Bankcred: Total credit of commercial banks and NBFIs to private sector / nominal GDP

Chart 11
Financial Development Indicators
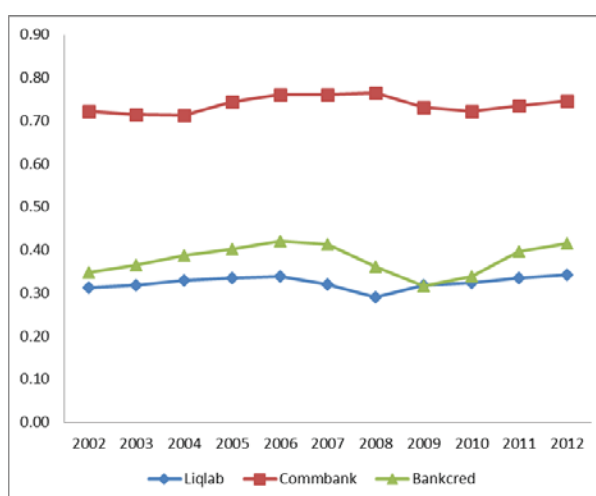
The growth in liqliab, Commbank and bankcred is evident after the end of the 30-year war in 2009, reflecting increased financial activity in the economy with increased investor confidence in the country's financial markets. Credit allocation to the private sector has particularly increased as the economic activities expanded significantly in 2010 and 2011.

3.3.2 Stock-market-related Development Indicators

MktCap: Total value of stocks in the domestic market / GDP
ValTrade: Total value of stock being traded / GDP
Turnover: Total value of stock being traded / Total value of stocks in the domestic market

257

Chart 12
Stock Market Development Indicators

MktCap sharply declined reflecting the downturn from 2006 to 2008 as investor sentiment in the stock market waned as the war intensified, increasing uncertainty in the financial markets. The effects of the GFC too affected the stock market in 2008 with foreign investors pulling out of the market. Since the end of the war in May 2009, the stock market was rejuvenated with local as wel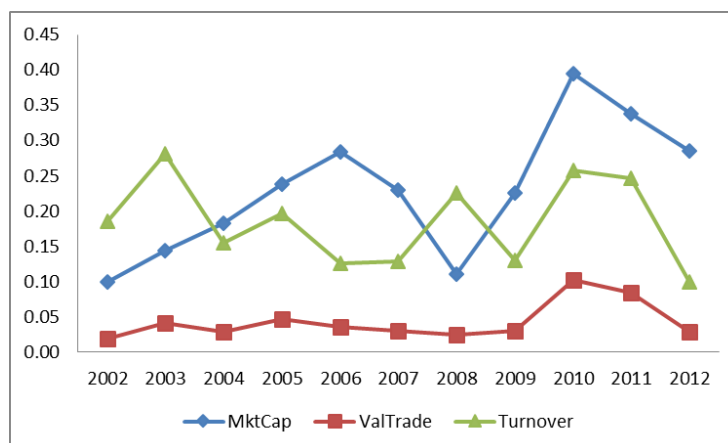l as foreign investments, and the market capitalisation doubled in 2009 and 2010. The stock market price indices declined in 2011, which was considered a price correction after two consecutive years of upsurge in prices. Market capitalisation and turnover therefore declined in 2011 as well as in 2012, with net foreign outflows and credit restrictions imposed on stock brokers.

3.4 Financial Market Transactions Through RTGS

Transactions relating to money, forex, bond and securities markets are settled through the RTGS. While money and bond market (government securities) related RTGS settlements can be identified, forex, equity and corporate debt related transactions that are settled through the RTGS cannot be identified as they are settled through the settlement banks or the LCPL which aggregate and settle transactions through the RTGS in batches. Hence, the RTGS system has no mechanism to identify the original transaction type. In order to obtain the RTGS transaction data segregated by financial market type, the information would need to be obtained from the sources, such as the banks and other FMIs that are linked to the RTGS.

4. Analysis

The interconnectedness of the RTGS system with the other FMIs and financial markets exposes it to internal as well as external shocks. Since the RTGS system is a systemically important FMI, its ability to ensure undisrupted settlement during crisis periods is vital in maintaining the financial stability of the country. Hence, an event analysis was carried out to assess the impact on the RTGS from an identified external shock and an internal shock.

4.1 Event Analysis

The analysis of the identified external and internal shocks evaluates the impact of the event on the financial markets and the RTGS system in Sri Lanka.

4.1.1 External Shock – Global Financial Crisis

The GFC of 2007/2008 was identified as the external shock for the purpose of this event analysis. The most significant impact of the GFC was felt in the external and real sectors of the Sri Lankan economy. There were foreign capital outflows as investors pulled out from the equity and government securities markets. New foreign investments declined sharply. With USA and Europe, the countries which were most affected by the GFC, being Sri Lanka's major export destinations, the demand for exports declined. With increasingly less foreign currency available in the domestic market, there was increased pressure on the exchange rate. The country's official reserves declined by 50% as the CBSL intervened in the market to avoid any excessive volatility in the exchange rate. The balance of payment surplus of the previous year turned into a deficit in 2008. As the depreciation of the exchange rate increased the pressure on prices to increase, inflation increased to its highest level of 22.6% since 1980. The GDP growth declined from 6.8% in 2007 to 6% in 2008 and 3.5% in 2009.

The impact of the GFC on the country's financial markets was evident in the forex market as volumes of imports and exports slowed in 2009 and 2010 (Chart 10). However, there was no impact of the GFC on the RTGS as the volume of forex related transactions that settles through the RTGS is very small comparatively.

4.1.2 Internal Shock – Macroeconomic Imbalances in 2012

Sri Lanka's economy experienced a turbulent time as a result of several factors, such as natural causes, financial and other macroeconomic imbalances.

Extreme weather conditions severely affected the agricultural sector. Severe drought conditions affected hydropower generation causing energy prices to increase. This year was also characterised by high credit growth and high monetary expansion while trade deficit widened as imports increased rapidly. The GDP growth declined sharply to 6.4% in 2012 from 8.4% in 2011.

The internal shock of macroeconomic imbalances had no significant impact on the financial markets other than slowing down activities in the money, forex and equity markets (Chart 10). Further, there was no impact on the RTGS other than a decline in the value of total transactions during the year.

4.1.3 Conclusion of the Event Analysis

The analysis of the external and internal shocks above shows that the interconnectedness of the RTGS system is limited and that both shocks caused decline in activities in some financial markets. Hence, there was no impact on the RTGS as during both periods the RTGS operated without any disruptions.

4.1.4 Risk Mitigation Measures of RTGS

The RTGS has several risk mitigation measures in place. In order to mitigate credit risk, the membership of the RTGS is limited to mostly financial institutions that are licensed and regulated by the CBSL. Since the RTGS is a gross settlement system, the exposure to liquidity risk is very high. Hence, the CBSL makes available an ILF to all participants to mitigate liquidity risk. The ILF is provided under a collateralised system by means of eligible securities such as government securities. Due to the provision of unlimited ILF, there have been no instances of payment disruptions in the RTGS since its inception. The operational risk in the RTGS is also mitigated through the establishment of a comprehensive Business Continuity Plan (BCP) and a disaster recovery site (DRS). Live operations are conducted at the DRS site twice a year.

4.2 Bivariate Correlation Analysis

A bivariate correlation analysis was carried out on PS/GDP with the Financial Development Indicators (FDIs) and Stock Market Development Indicators (SMDIs) to ascertain the correlation of these indicators with the activity in the payment system. The results in the Table 8 below indicate that, out of the FDIs, Commbank and Bankcred are negatively correlated to PS/GDP within 1% and 10% significant levels, respectively. Liqliab has no significant relationship to PS/

260

GDP. SMDIs, however, are all positively correlated with PS/GDP, with Mktcap and ValTrade at 1% level of significance.

Table 8
Bivariate Correlation of PS/GDP with FDIs and SMDIs

Correlation (t Statistic)	PS/GDP	Financial Development Indicators			Stock Market Development Indicators		
		Liqliab	Commbank	Bankcred	Mktcap	ValTrade	Turnover
PS/GDP	1.00 -----						
Liqliab	0.01 (0.08)	1.00 -----					
Commbank	-0.43 (-2.89)***	-0.34 (-2.19)**	1.00 -----				
Bankcred	-0.33 (-2.13)**	0.64 (5.03)***	0.23 (1.44)	1.00 -----			
Mktcap	0.53 (3.72)***	0.45 (3.07)***	-0.61 (-4.57)***	0.06 (0.35)	1.00 -----		
ValTrade	0.62 (4.74)***	0.06 (0.35)	-0.58 (-4.32)***	-0.45 (-3.04)***	0.72 (6.29)***	1.00 -----	
Turnover	0.30 (1.91)*	-0.06 (-0.39)	-0.38 (-2.46)**	-0.52 (-3.67)***	0.24 (1.51)	0.796 (7.90)***	1.00 -----

Significance at * 10% level, ** 5% level, ***1% level.

4.3 Discussion on FMI Oversight and Supervisory Framework

The CBSL is the regulatory authority of the systemically important FMIs, such as RTGS and SSSS. In addition, the CBSL issues general directions to the LCPL and participating institutions of SLIPS and CITS and conducts oversight examination for compliance with the regulations and guidelines. Hence, there is no fragmentation of supervision and oversight with respect to the major FMIs in Sri Lanka. The stock market related FMIs (i.e., ATS, DEX and CDS) are licensed by the SEC while the oversight responsibility of these is with the CSE.

Table 9
Regulatory Authorities of FMIs

System	Regulatory Authority
RTGS , SSSS, SSDS	Central Bank of Sri Lanka
SLIPS, CITS	Operated by LankaClear (Pvt) Ltd. & Regulated by Central Bank of Sri Lanka
ATS, DEX, CDS	Colombo Stock Exchange (CSE)

In addition to its regulatory function over the SSSS, the CBSL provides the ILF to the PDs and LCBs for their intraday financial requirements, provided that necessary collateral is pledged.

Over the years, foreign investments in the domestic financial markets have increased. However, all these investments are channelled through the banks and, hence, the FMIs in Sri Lanka have no direct link with those of any other country.

However, with the expected increase in economic activity and transactions in the financial markets, there will be increased interconnectedness among the FMIs in the country. Moreover, with the proposed implementation of a common e-trading platform for secondary market transactions of government securities and corporate debt, the regulatory coordination for the FMIs will need to be established between the relevant authorities.

5. Conclusion and Recommendations

5.1 Conclusion

The study analysed the interdependencies of FMIs in Sri Lanka, specifically that of the RTGS system which is the systemically important FMI in the country. Since the RTGS is interconnected with the other FMIs and financial institutions, it is a critical component of the financial system of the country and hence plays an important role in the financial intermediation function and facilitates the smooth and efficient functioning of financial markets in the country. Although currently the volume of capital market transactions that courses through the RTGS is not significant, it is expected that these volumes will gradually increase with the implementation of multi-pronged measures being taken to develop the capital market in the country. The legal and regulatory frameworks of the RTGS system and the other FMIs have been strengthened over the years and most are on par with international standards.

The key objective of this paper which purposes to carry out an analysis to ascertain the direct and indirect relationships of the payment system with the different financial markets and institutions was constrained due to a lack of disaggregated information in relation to the RTGS transactions. However, the analysis identified that the financial and stock market development indicators, such as commercial banks assets, private sector credit and stock market capitalisations and stock market turnover have a significant impact on the payment system volumes.

262

5.2 Recommendations

- Considering the interconnectedness between the RTGS and financial markets, it is recommended to strengthen the data quality and to enable disaggregated data to facilitate analysis on risks arising from the interconnectedness.

- Since there is interconnectedness between the different FMIs which come under the purview of different regulatory bodies such as the CBSL, SEC and CSE, it would be necessary to have a formalised regulatory coordination between these regulators to ensure the smooth functioning of these FMIs, specifically in times of crisis.

- Since the financial institutions are participants in multiple FMIs as well as multiple financial markets, information sharing between systems, markets and participants will be important.

- Coordinated BCP arrangements between all the regulators and participants and possibly a common DRS site will contribute towards enhancing risk mitigation in these interdependent FMIs.

References

Bank for International Settlements, Committee on Payment and Settlement Systems, (2004), Payment System in Sri Lanka, December 2004.

Central Bank of Sri Lanka, Annual Reports, 2006-2012.

Central Bank of Sri Lanka, Payment Bulletin, 2012 Q3 – 2013 Q1.

Central Bank of Sri Lanka, Recent Economic Developments, 2009-2012.

Central Depository System –available at http://www.cds.lk/index.html;jsessionid=DA407E61940F7DBF3267FD9791E303E5

Colombo Stock Exchange – available at http://www.cse.lk/home.do

Economic and Social Statistics of Sri Lanka, 2013.

Abbreviations

|		
ATS	–	Automated Trading System
CBSL	–	Central Bank of Sri Lanka
CCP	–	Central Counterparty
CDS	–	Central Depository System (equity and Corporate Debt)
CITS	–	Cheque Imaging and Truncation System
CSE	–	Colombo Stock Exchange
DEX	–	Debt Securities Settlement System
EPF	–	Employees Provident Fund
FX	–	Foreign Exchange
ILF	–	Intraday Liquidity Facility
LCB	–	Licensed Commercial Banks
LCPL	–	LankaClear Pvt. Ltd
MLNS	–	Multilateral Net Settlements
PD	–	Primary Dealers
RTGS	–	Real Time Gross Settlement System
SEC	–	Securities Exchange Commission
SLIPS	–	Sri Lanka Interbank Payments System
SSDS	–	Scripless Securities Depository System
SSSS	–	Scripless Securities and Settlement System

Key Macroeconomic Indicators

Indicators	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
1. Demography											
1.1 Mid year population ('000 persons)	19,007	19,252	19,462	19,668[b]	19,886[b]	20,039[b]	20,217[a]	20,450[a]	20,653[a]	20,869[a]	20,328[c]
1.2 Unemployment rate (per cent of labour force)	8.8	8.4	8.3	7.2[d]	6.5[d]	6.0 [d]	5.4[d]	5.8[e]	4.9[e]	4.2[f]	4.0[f]
2. GDP											
2.1 GDP at current market prices (Rs. billion)	1,582	1,761	2,029	2,453	2,939	3,579	4,411	4,835	5,604	6,544	7,582
2.2 GDP at current market prices (US$ billion)	16.4	18.2	19.4	24.0	27.3	32.9	39.0	42.3	50.5	57.5	59.6
2.3 Per capita GDP at market prices (Rs.)	82,068	90,472	103,679	124,709	147,776	178,845	218,167	236,445	271,346	313,576	373,001
2.4 Per capita GDP at market prices (US$)	870	948	1,030	1,226	1,402	1,617	2,014	2,057	2,400	2,836	2,923
3. Real GDP Growth rate (percentage)	4.0	6.0	5.4	6.2	7.7	6.8	6.0	3.5	8.0	8.2	6.4
4. Inflation											
4.1 Colombo Consumers' Price Index Annual average (% change)	9.6	6.3	7.6	11.0	10.0	15.8	22.6	3.4	5.9	-	-
4.2 Colombo Consumers' Price Index (YOY)	11.3	5.0	13.8	7.4	13.5	18.8	14.4	4.8	6.9	-	-
4.3 Colombo Consumers' Price Index (2006/07=100) Annual average (% change)	-	-	-	-	-	-	-	3.5	6.2	6.7	7.6
4.4 Colombo Consumers' Price Index(2006/07=100) (YOY)	-	-	-	-	-	-	-	5.0	6.8	4.9	9.2
5. Government Finance (Per cent of GDP)											
5.1 Current Account deficit(-)/surplus (+)	-4.4	-3.3	-3.9	-2.6	-2.4	-1.6	-2.0	-3.7	-2.1	-1.1	-1.4
5.2 Budget deficit (before grants)	-8.9	-8.0	-8.2	-7.0	-7.0	-6.9	-7.0	-9.9	-8.0	-6.9	-6.4
5.3 Government debt (total)	105.4	105.8	105.5	90.6	87.8	85.0	81.4	86.2	81.9	78.5	79.1
6. External Finance (US$ million)											
6.1 Exports	4,699	5,133	5,757	6,347	6,883	7,640[g]	8,111[g]	7,085[g]	8,626[g]	10,559[g]	9,744[g]
6.2 Imports	6,105	6,672	8,000	8,863	10,253	11,296[g]	14,091[g]	10,207[g]	13,451[g]	20,269[g]	19,183[g]
6.3 Trade balance	-1,406	-1,539	-2,243	-2,516	-3,370	-3,657	-5,981	-3,122	-4,825	-9,710	-9,409
6.4 Current account balance	-237	-71	-648	-650	-1,499	-1,402	-3,886	-214	-1,075	-4,615	-3,915
6.5 overall balance	338	502	-205	501	204	531	-1,385	2,725	921	-1,061	151

Indicators	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
6.6 Gross official reserves (US$ million)	1,700	2,329	2,195	2,735	2,837	3,508	2,402	5,357	7,197	6,748	7,105
6.6 Gross official reserves (months of same year imports)		4.2	3.3	3.7	3.3	3.7	2.0	6.3	6.4	4.0	4.4
7. Interest Rates (per cent per annum at end year)											
7.1 Bank rate	18.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
7.2 Treasury bill yield – Primary											
7.2.1 91 days	9.9	7.4	7.3	10.1	12.8	21.3	17.3	7.7	7.2	8.7	10.0
7.2.2 182 days	9.9	7.3	7.7	10.3	12.8	20.0	18.6	8.7	7.4	8.7	11.3
7.2.3 364 days	9.9	7.2	7.7	10.4	13.0	20.0	19.1	9.3	7.6	9.3	11.7
7.3 Repo (overnight)	9.8	7.0	7.5	8.8	10.0	10.5	10.5	7.5	7.3	7.0	7.5
7.4 Reverse Repo (overnight)	11.8	8.5	9.0	10.3	11.5	12.0	12.0	9.8	9.0	8.5	9.5
7.5 Commercial banks' average weighted deposit rate	7.5	5.3	5.3	6.2	7.6	10.3	11.6	8.0	6.2	7.2	10.1
7.6 Commercial banks' average weighted prime lending rate	12.2	9.3	10.2	12.2	15.2	18.0	18.5	10.9	9.3	10.8	14.4
8. Exchange rate											
8.1 Period average (Rs./US$)	95.7	96.5	101.2	100.5	104.0	169.4	171.2	177.2	172.5	174.5	195.4
8.2 End-period (Rs./US$)	96.7	96.7	104.6	102.1	107.7	108.7	113.1	114.4	111.0	113.9	127.2
9. Capital Market											
9.1 All Share Price Index	815.1	1,062.1	1,506.9	1,922.2	2,722.4	2,541.0	1,503.0	3,385.6	6,635.9	6,074.4	5,643.0
9.2 Net purchases by non-nationals (Rs. million)	2,442.0	209.0	1,109.0	6,145.0	5,377.0	11,254.0	13,951.0	-789.0	26,335.0	-19,039.0	38,661.0
9.3 Market capitalization (Rs. billion)	162.6	262.8	382.1	584.0	834.8	820.7	488.8	1,092.1	2,210.5	2,213.9	2,167.6

(a)Provisional, (b) Revised based on statistics on 'Vital Events 2000-2010' published by Register General's Department in January 2011, (c) Based on Census of population and Housing carries out in 2012,covering the entire island, (d) Data excluding both Northern and Eastern Provinces, (e) Data excluding Northern Province, (f) Data covers the entire island, (g) Excludes re-exports and re-imports from 2007 onwards

Interconnectedness of Financial Market Infrastructure
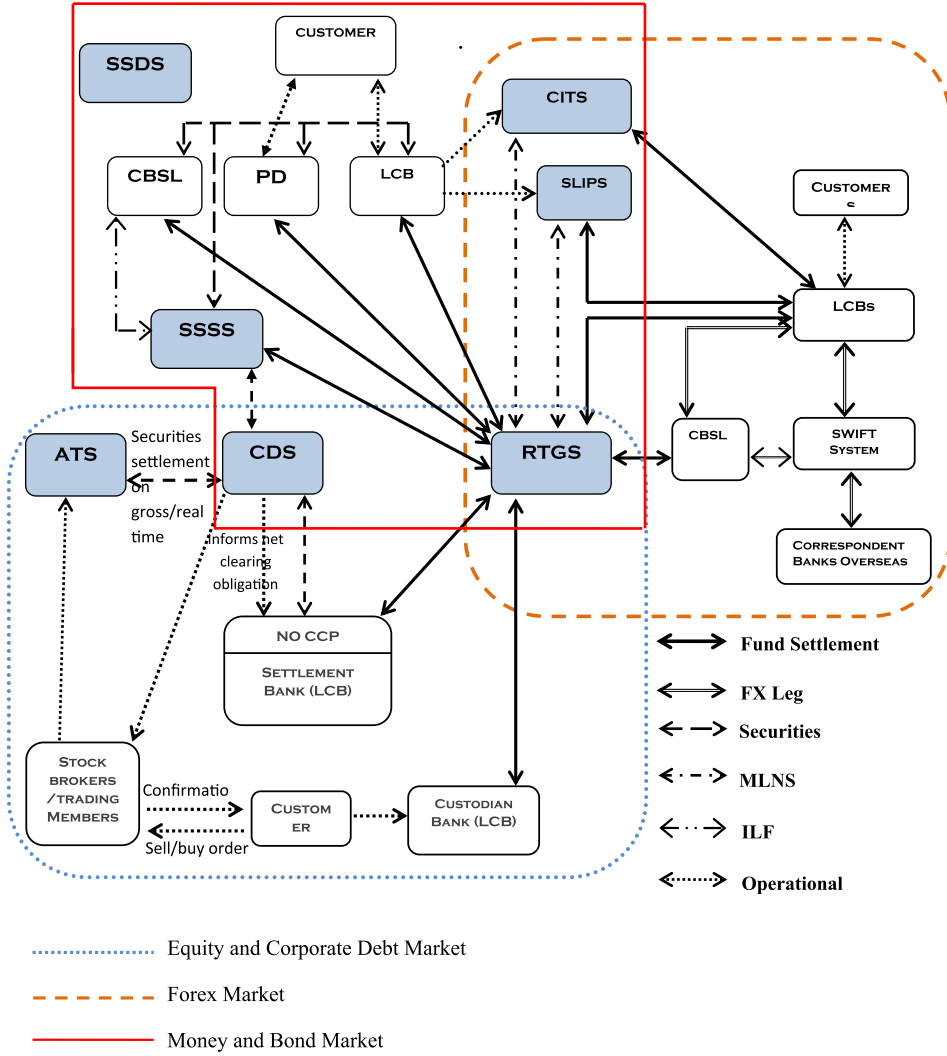
Transaction Volumes of Payment Systems in 2012

FMI	Established	Operated by	Payment System									
			Total Volume 2012							Average Daily Volume 2012		
			No of transactions	% of total no. of transactions	Rs bn	% of total Value	USD mn	% of GDP		Rs bn	USD mn
RTGS	2003	CBSL	284,561	0.45	43,255	85.77	340,160	576.4		179	1,408
CITS	2006	LCPL	47.8 mn	76.92	6,592	13.07	51,840	87.8		27.2	214
SLIPS	1993 2002	SLACH (CBSL) LCPL	14 mn	22.50	553	1.09	4,349	7.4		2.28	17.9
USD cheque clearing system	2002	LCPL	53,600	0.08	26.4	0.05	207.6	0.4		0.109	0.9
Rupee draft clearing system	1950 1988 2002	CBSL SLACH (CBSL) LCPL	na	Na	0.371	0.00	2.9	0.004		0.0015	0.12

Transaction Volumes of Capital Market FMIs in 2012

Capital Market FMI – Trading and Settlement Systems

FMI	Established	Operated by	Total Volume 2012				Average Daily Volume 2012	
			No of transactions	Rs bn	USD bn	% of GDP	Rs bn	USD mn
SSSS	2004	CBSL	574,577	35,442.8	278.7	472 %	147.1	1,156
ATS	1997	CSE	9,691.2 mn	213.8	1.68	2.8%	0.88	6.9
DEX		CSE	41	0.0818	0.0006	0.001 %	0.0031	

Capital Market FMI – Central Depositories

FMI	Established	Operated by	Securities in Custody (end 2012)		Dematerialised Accounts (end 2012)	
			Number	Value (Rs bn)	Excl. multiple registration	With multiple registration
CDS (G-sec)	2004	CBSL	ISINs 139	3,204.7	n/a	78,896
CDS (Equity/ Corp debt)	1997	CSE	Equity 67 bn Debt 324 mn	Equity 1,959 Debt 34	535,576	702,438

Chapter 9

ANALYTICAL FRAMEWORK IN ASSESSING SYSTEMIC FINANCIAL MARKET INFRASTRUCTURE IN CHINESE TAIPEI

By
Chuan-Chuan Chen
and
Yilin Tsai[1]

1. Introduction

The financial market infrastructures (FMIs)—involving payment systems (PSs), security settlement systems (SSSs), central counterparties (CCPs), central securities depositories (CSDs) and trade repositories (TRs)—facilitate the functioning of the financial market and support economic growth. The FMIs also help the market participants to better manage their exposures. Accordingly, any malfunction and inappropriate design of the FMIs may expose the participants to systemic risks and endanger financial stability. As payment and settlement systems have evolved significantly, there is a need to study the interdependencies among the systems. In this regard, the following sections lay out the motivations and research objectives of this paper as well as a brief introduction on Chinese Taipei's economy.

1.1 Motivations of the Study

Among the FMIs, the CBC Interbank Funds Transfer System (CIFS) is the most important Payment System in Chinese Taipei. It provides final settlement services for fund transfers related to call-loan, foreign exchange and securities transactions. In the study, we focus on the analysis of interdependencies between the CIFS and the other domestic systemically important FMIs. Moreover, as the 2008 financial crisis spread around the world, it caused a liquidity squeeze in the global asset-backed securities market and introduced higher volatilities among securities market in Chinese Taipei. This paper will also investigate the global financial crisis' impacts on the CIFS.

1.2 General Information about Chinese Taipei[2]

Consisting of the Taiwan island, the Penghu, Kinmen and Matsu archipelagoes, and numerous outlying islets, with areas summing to around 36,000 km[2], Chinese Taipei is circumscribed by coasts, with the Taiwan Strait to its west, where across the strait lies the Mainland China, the East China Sea to the north, the Philippine Sea to the east, the Luzon Strait to the south and the South China Sea to the southwest. Moreover, the Tropic of Cancer (23.5ÚN) spans across the southern Taiwan Island and the still active plate tectonic movements carve its landscapes into rich geological features—more than 40% covered by mountains as well as varied climate zones, nourishing biodiversity to a great extent. The population is over 23 million people, mostly living in urban cities, such as Taipei, Taichung and Kaoshiung.

Chinese Taipei has undergone phases of industrial transitions in the past three decades. In 1980s, its economy was able to catch up with the trend of global economic growth, proceeding to a more capital-intensive and export-oriented economy. The "Hsinchu Science Park"[3], established in 1980, has become one of the most famous regions for manufacturing semiconductors, serving as the dominant drive to boost the economic momentum. As of 2012, the economy's GDP per capita reached US\$ 20,386. In the same year, while the service sector contributed to 69.15% of GDP, the manufacturing sector accounted for 28.95% of GDP, slightly declining from the previous year as a result of the weak external demand after 2010. On the other hand, the inflation rates were benign over time (see Table 1).[4]

---

2. For more information about Chinese Taipei, please refer to the "The Republic of China Yearbook 2012" at: http://www.ey.gov.tw/en/cp.aspx?n=575A019C0A39897D.

3. Please visit its official site at http://www.sipa.gov.tw/english/index.jsp for more information.

4. Also see Appendix 1 for a summary of Chinese Taipei's economic indicators in 2012.

Table 1
Economic Profile of Chinese Taipei

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	AVG
GDP (USD, bn)	311	340	365	376	393	400	378	428	464	474	393
GDP per capita (USD)	13,773	15,012	16,051	16,491	17,154	17,399	16,359	18,503	20,006	20,386	17,113
Economic Growth (%)	3.67	6.19	4.7	5.44	5.98	0.73	-1.81	10.76	4.07	1.32	4.11
Inflation rate (%)	-0.28	1.61	2.30	0.60	1.80	3.52	-0.86	0.96	1.42	1.93	1.30
Exchange rate (USD/NTD)	34.42	33.43	32.18	32.53	32.84	31.54	33.06	31.65	29.47	29.62	32.07
Yearly average											

Source: Directorate-General of Budget, Accounting and Statistics, Executive Yuan, Chinese Taipei; CBC.

As for foreign exchange management, since 1987, the Central Bank, Chinese Taipei (CBC) has loosened the relevant foreign exchange regulations. To date, capital movements are completely liberalised[5]. The New Taiwan dollar (NTD) was 29.62 on average against the US dollar in 2012, and 29.14 at the end of 2012, indicating a 3.96% appreciation from the end of 2011. Foreign exchange reserves arrived at US$403.17 billion, increased by US$17.67 billion at the end of 2012.

For the year ahead, the national statistics estimated a steady 2.40% GDP growth in 2013 compared with the previous year's 1.32% growth. Following the 2008 financial crisis, the European debt problem also poses a risk to the global economy, and the global economic outlook remains somewhat obscure. However, concerning the long-term national development, the Executive Yuan[6] has mapped out the "Economic Power-Up Plan"[7] earlier this year to solve the current structural imbalances and seize the upgrading opportunities to stimulate the economy progress even further. Meanwhile, in World Bank's Knowledge Economy Index (KEI), Chinese Taipei was ranked top in Asia and 13th worldwide in 2012, showing Chinese Taipei's economic vitality and competitiveness in relation to knowledge economy.

_____

5. Please see http://www.cbc.gov.tw/ct.asp?xItem=857&CtNode=481&mp=2 for relevant information.

6. The Executive Yuan is the executive branch of the Chinese Taipei government. Please see http://www.ey.gov.tw/en/cp.aspx?n=95097CAF31185CC1.

7. For further information, please refer to the newsletter released by the Council for Economic Planning and Development at http://www.cepd.gov.tw/encontent/m1.aspx?sNo=0017911.

1.3 The Impact of Global Financial Crisis on Major FMIs in Chinese Taipei

Following the bankruptcy of Lehman Brothers, the financial crisis in 2008 has spread round the world. Since FMIs play an important role in maintaining financial stability, for central banks a recent concern is raised whether a financial stress, such as the 2008 financial crisis, will invoke contagion risks and what the potential impacts on FMIs will be as they become more and more interconnected. Accordingly, this paper aims to shed some light on how the impact of 2008 financial crisis could be translated to the FMIs in Chinese Taipei. In 2008, though the market transaction value contracted, the annual transactions of domestic payment systems as well as the Taiwan Depository and Clearing Corporation (TDCC, a CSD) have been stably increasing since then. As for the Electronic Bond Trading System of the GreTai Securities Market (GTSM-EBTS), the transaction values have reduced since 2007, mainly owing to the decreasing security trades in the bond markets. The stock transactions in the Taiwan Stock Exchange (TWSE), on the other hand, were affected by the global financial crisis; its annual transaction volume had contracted as the investors became more cautious[8]. (See Appendix 2 for transaction data of major FMIs).

1.4 Research Objectives

The research objectives are twofold. Firstly, we analyse the interdependencies between the CIFS and other associated clearing institutions. In Section 2, we begin with the current framework of systemically important FMIs in Chinese Taipei—the CIFS and the other systemically important systems jointly comprise the fundamental network of Chinese Taipei's payment and settlement systems. In Section 3, the level of interdependencies is shown by mapping the transaction linkages between CIFS and the other FMIs and financial market. We will also briefly discuss the domestic regulations and oversight practices.

Secondly, from the transaction values, we investigate how the 2008 financial crisis influenced the major domestic payment systems and how the impacts on the markets and retail transactions were transmitted to the CIFS. In Section 4, we conduct an empirical statistical analysis to examine the transmission effects of the 2008 financial crisis and the interactive relationships among the concerned variables. In addition, we also present a correlation matrix showing the relationships between the ratio of the CIFS to GDP and related financial indicators. Finally, Section 5 provides a summary and the concluding remarks.

---

8. Please refer to the CBC, (2008) "Financial Stability Report," Issue No. 2.

2. Financial Market Infrastructures in Chinese Taipei

FMIs, according to the "Principles for Financial Market Infrastructures" published by the Bank for International Settlements (BIS) and the International Organisation of Securities Commissions (IOSCO) in 2012, include PSs, CSDs, SSSs, CCPs and TRs, which facilitate the functioning of financial activities, maintain financial stability and promote economic growth.

In Chinese Taipei, owing to the development of financial liberalisation and innovative technology, the FMIs have evolved significantly over the recent decades. The CIFS plays a significant role in domestic FMIs. Besides the CIFS, the Central Government Securities Settlement System of the CBC (CGSS), the Financial Information System of the Financial Information Service Corporation (FISC-FIS), the Check Clearing System of the Taiwan Clearing House (TCH-CCS), the TDCC, the GTSM, the TWSE, and the Taiwan Futures Exchange (TAIFEX) are the major FMIs.

2.1 General Policy and Regulation Framework

The CBC coordinates with the Financial Supervisory Commission (FSC) on the oversight and supervision of FMIs to ensure the safety and efficiency of FMIs. Furthermore, the CBC relies on the sound operation of FMIs to implement monetary policy effectively. The CBC has been dedicated to complying with the requirements of global principles and recommendations published by the BIS-Committee on Payment and Settlement Systems (BIS-CPSS) in reforming these FMIs to enhance their safety and efficiency.

In Chinese Taipei, some FMIs, such as the CCP, CSD and SSS, are under the supervision of the FSC. On the other hand, the payment systems, particularly those which have their payments settled in the CIFS, are overseen by the CBC to ensure the safe and efficient operation of the CIFS.

2.2 Stylised Facts of FMIs in Chinese Taipei

The important operators of FMIs in this economy are the CBC, the FISC, the TCH, the TDCC, the TWSE, the GTSM and the TAIFEX.

The CBC-operated CIFS plays the core role among important FMIs. The CIFS, a systemically important Large Value Payment System, launched in May 1995, has adopted the Real-Time Gross Settlement (RTGS) mechanism since 2002. It provides transferring services for interbank funding, reserves requirement

adjustment and settlement for call loans, the NTD leg of foreign currency trades, and the payment leg of bond and bill trades. In addition, the CIFS provides services for clearing institutions such as TCH, FISC, TDCC and TWSE. The transaction value of the CIFS reached NT$388 trillion (US$13 trillion) in 2012, around 28 times of the GDP.

Furthermore, the CGSS was introduced by the CBC in 1997 for the operation of issuance, transfer, redemption, and interest payment of government securities. Through the linkage of the CGSS and the CIFS in 2008, the delivery versus payment (DVP) mechanism has been installed to eliminate the settlement risk.

The FISC, established in 1998, through the linkage of its on-line interbank network with the CIFS, provides the service of a real-time interbank funds transfer system (FISC-FIS) for cash withdrawals and funds transfers via Automated Teller Machines (ATMs) and interbank remittance services. The transaction value of the FISC-FIS is US$4 trillion in 2012, around 8 times of the GDP.

In 2002, 16 domestic check clearing houses donated their properties and instituted the "Taiwan Payments Clearing System Development Foundation". Under the Foundation, the TCH was founded to carry out the check clearing operation. The main system operated by the TCH is the Check Clearing System (TCH-CCS), under which the net accrued balances payable or receivable after clearing are sent to the CIFS for settlement. In 2012, the transaction value of the TCH-CCS amounted to US$617 billion.

The Taiwan Securities Central Depository Co., Ltd. (TSCD) was founded in 1989 to provide book-entry, clearing and settlement of securities transactions. In 2004, the Debt Instruments Depository and Clearing Co., Ltd. Taiwan (DIDC) was established and provided the services of custody, registry and short-term bill's book-entry operation with their funds settled through the CIFS. In 2006, the TDCC was established after the merger of the DIDC and the TSCD. The TDCC promotes the integration of settlement, clearing and central depository platforms for both equity and fixed income securities. It provides the services such as registration, custody and book-entry operations, which makes immobilised or dematerialised form possible for most securities.

The TWSE acts as a CCP for all the trades executed in the central Securities Exchange Market. The settlement mechanism has been changed since the TSCD was established which enabled the new book-entry settlement mechanism to be feasible. Since 1995, all investors have been required to have both a book-entry securities depository account and a bank account before they trade in the

276

Exchange. The TWSE also adopts a same-day clearing method and uses multilateral netting for the calculation of shares and funds receivables and payables with T+2 settlement cycle.

On the other hand, the GTSM was established in 1994 to deal with over-the-counter trading and provide financial trading services for the issuance and exchange of financial products. The GTSM provides a centralised electronic trading system for the trading of GTSM-listed stocks. Moreover, the GTSM offers over-the-counter trading mechanisms for the GTSM emerging stocks, government and corporate bonds, and derivatives. On the instruction of the FSC, the GTSM established the OTC Derivatives Trade Repository, which has been effective since April 2012 and broadly adopted since July 2013, to provide more transparency for the market and information for the supervisory authority.

The TAIFEX has started trading since July 1998. Currently the TAIFEX provides trading for futures and options on major Chinese Taipei stock indices, government bond futures, equity options, single stock futures and gold futures. The TAIFEX provides the services of TAIFEX Electronic Trading System (TAIFEX-ETS) for the trading of futures and options contracts. The TAIFEX conducts clearing and settlement through its Clearing Department. In 2012, the trading volume in futures and options totaled 156,731,912 contracts.

According to the definition depicted in the "Principles for Financial Market Infrastructures" (BIS, 2012), this paper attempts to divide the important FMIs into five types as shown in Table 2.

Table 2
FMI Type of Major FMIs in Chinese Taipei

SN	FMI Type		FMIs
1	Payment System		CIFS, FISC-FIS, TCH-CCS
2	Capital Market-related FMIs	CSD	TDCC
3		SSS	CGSS, TDCC
4		CCP	TWSE, GTSM, TAIFEX
5		TR	GTSM*

*Here it refers to the OTC Derivatives Trade Repository of the GTSM.

2.3 Oversight and Supervisory Authority in Chinese Taipei

Pursuant to the Article 2 of the Organic Act Governing the Establishment of the Financial Supervisory Commission, "The FSC shall be the competent authority for development, supervision, regulation, and examination of financial markets and financial service enterprises…the Central Bank shall be the competent authority in charge of the financial payment system," the financial markets are under the regulation of the FSC. However, the CBC is the authority of payment systems.

In addition, pursuant to the Article 32 of the Central Bank of the Republic of China (Chinese Taipei) Act, "Regulations governing checks clearance and settlement of accounts among banks shall be stipulated by the (Central) Bank," the check clearing system is under the regulation of the CBC.

Therefore, CCP, CSD and SSS, such as the TWSE, GTSM, TDCC and TAIFEX, are supervised by the FSC. However, in practice, some important FMIs, such as the FISC-FIS, TCH-CCS, and Bills Clearing System of the Taiwan Depository and Clearing Corporation (TDCC-BCS), which have their payment legs settled through the CIFS are overseen by the CBC and are regarded as the systemically important payment and settlement systems in the study. The reason is that any failures of these systems could harm the sound operation of the CIFS, and hence trigger disruptions in or transmit shocks across the domestic financial markets and economic activity, and thus create potential systemic risk. However, the FSC remains the regulatory authority of the FISC, TDCC, TWSE, GTSM and TAIFEX.

Table 3
The Overview of the Supervisory Entities in Chinese Taipei

| SN	FMI Type	Ownership/ Sponsorship	FMI (name)	Authorisation, Designation, or Licensing	Oversight	Supervision	Onsite Inspection
1	PS	Public	CIFS	CBC	CBC	CBC	CBC
2	PS	Private	FISC	FSC	CBC/FSC	FSC	FSC
3	PS	Private	TCH	CBC	CBC	CBC	CBC
4	SSS	Public	CGSS	CBC	CBC	CBC	CBC
5	CSD/ SSS	Private	TDCC	FSC	FSC/CBC	FSC	FSC
6	CCP	Private	TWSE	FSC	FSC	FSC	FSC
7	CCP	Private	GTSM	FSC	FSC	FSC	FSC
8	CCP	Private	TAIFEX	FSC	FSC	FSC	FSC

2.4 The Interdependency of FMIs in Chinese Taipei

As the hub of domestic payment systems, the CIFS links with the FISC-FIS and the TCH-CCS which enables these payment systems to be in use of central bank money for settlement to ensure their sound and efficient operation.

In addition, to enhance the efficiency and safety of the payment leg of securities settlement, the CIFS linked with the TDCC-BCS[9] in 2004, the Securities Book-Entry Clearing System of the Taiwan Stock Exchange (TWSE-SBECS) and GTSM-EBTS in 2007, and CGSS in 2008. These actions also make contribution to the TDCC-BCS and CGSS for the adoption of delivery versus payment (DVP) basis. Due to different necessity of these FMIs, the payments from these FMIs that settled by the CIFS are in the mode of real-time, deferred-netting or other mechanisms permitted by the CBC, the connection map are depicted in Chart 1.

---

9. The TDCC used to be the DIDC in 2004 (see p.4).

Chart 1
Framework of Important Payment and Settlement
Systems in Chinese Taipei
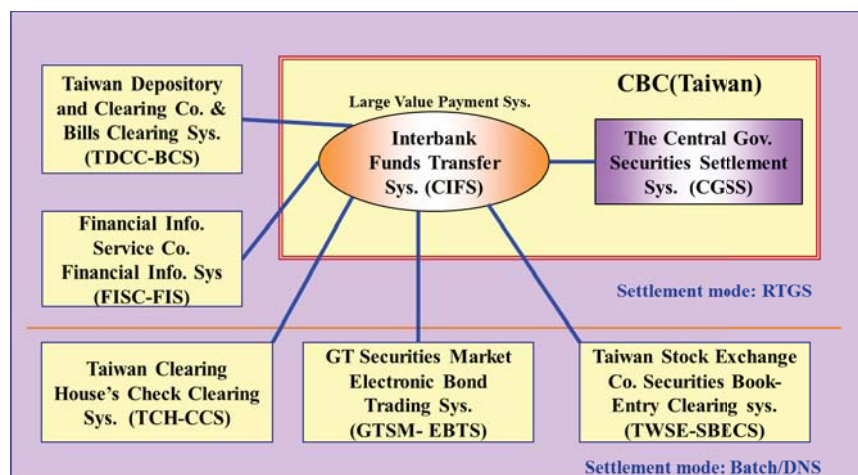
Source: CBC, "The Payment and Settlement Systems in the Republic of China (Chinese Taipei)," October 2010.

Undoubtedly, the above-mentioned linkage among the FMIs will promote the efficiency of liquidity, and ensure more safety and integrity. However, some risks may be derived from interdependencies which have been outlined from the report, "The Interdependencies of Payment and Settlement Systems," published by the Committee on Payment and Settlement Systems, Bank for International Settlements, in 2008.

Most of the domestic FMIs are not globally active payment and settlement infrastructures, though some connection may exist. Therefore, these FMIs may have less potential to be infected by any disruptions originating from the global FMIs. Nevertheless, disruptions or risks originating from some domestically important FMIs may still be harmful for the reason that they are linked with the CIFS, and may pose risks to the CIFS and then spread the risks to other FMIs or other system participants in financial markets.

The BIS-CPSS (2008) has presented three forms of interdependencies, i.e., system-based, institution-based and environmental interdependencies which arise from "direct relationships between systems, indirect relationships arising from the activities of large financial institutions in multiple systems and broader commonalities have led to a complex web of interconnections among numerous payment and settlement systems" (BIS-CPSS, 2008, p.7).

280

In Chinese Taipei, the CIFS, as an example, in addition to the system-based interdependencies as previously mentioned in the direct relationships between the CIFS and other FMIs, the institution-based interdependencies may also arise from the indirect relationships when the financial institutions are both the participants of the CIFS and other FMIs. In addition, the environmental interdependencies arise from the entities which provide connection (line) or electricity services to the CIFS, such as the Chunghwa Telecom and the Taiwan Power Company.

The Foreign Exchange Market is composed of two parts, the customer market and the interbank market. This paper focuses on the interbank market. In this market, there are two domestic brokers, the Taipei Forex Inc., started in 1994, and the Cosmos Foreign Exchange International Co. Ltd., started in 1998.

To enhance the efficiency and safety of the FMIs in the interbank Foreign Exchange Market, the CBC assisted the FISC to establish a foreign currency clearing platform which has put the USD clearing into operation on 1 March, 2013 and the RMB clearing on 30 September 2013. This platform may link with the different settlement banks for respective currencies. For example, the Mega International Commercial Bank is chosen as the USD settlement bank. Each settlement bank therefore implements the settlement of the respective currencies through the linkage with the foreign settlement system.

The overview of the domestic FMIs in financial markets is depicted in Table 4.

Table 4
Overview of Domestic FMIs in Financial Markets

SN	Markets	Clearing or Securities Settlement	Settlement
1	Money Market	GTSM / TDCC	CIFS
2	Bond Market	CGSS / GTSM / TDCC	CIFS
3	Forex Market	FISC	Settlement Banks
4	Securities Market	TWSE / GTSM / TDCC	CIFS

3. Financial Statistics

FMIs are indispensable for a nation to sustain financial activities. On the other hand, financial development has substantial impacts on the operation of

FMIs as well. The interaction between the FMIs and financial markets forms a main part of our discussion. Therefore, this section tries to collect the statistics of the FMIs and the financial markets with the purpose of tracing the tendency of both and the correlation in between to support this paper with comprehensive data resources. To interpret the operation of the CIFS more precisely, Section 3.1 focuses on the statistics of the CIFS. Moreover, since the financial market transaction value can provide a basis for comparison with the CIFS market-wise transaction value, and Section 3.2 adds the statistics of the financial market. Also, Section 3.3 calculates some financial-related development indicators to depict the financial progress in Chinese Taipei. In short, this section hopes to provide an inclusive indication on the CIFS and financial market progress since it may therefore provide the basis for analysis in Section 4 which discusses the relationship between the FMIs and financial markets activities.

3.1 Financial Market Infrastructures Statistics – CIFS

As the hub of the domestic FMIs, the CIFS forms the center of the following discussion with the statistics of its participants and transaction value. Through the following discussion, the overview of the CIFS operation may be described more thoroughly. Moreover, the time-series graphics of the CIFS are displayed to give the outline of this Large-Value Payment System's (LVPS) tendency.

3.1.1 CIFS Participants

Chart 2
The CIFS Participants from 2003-2012

*Number of Participants: the CIFS' active accounts at the end of the year.
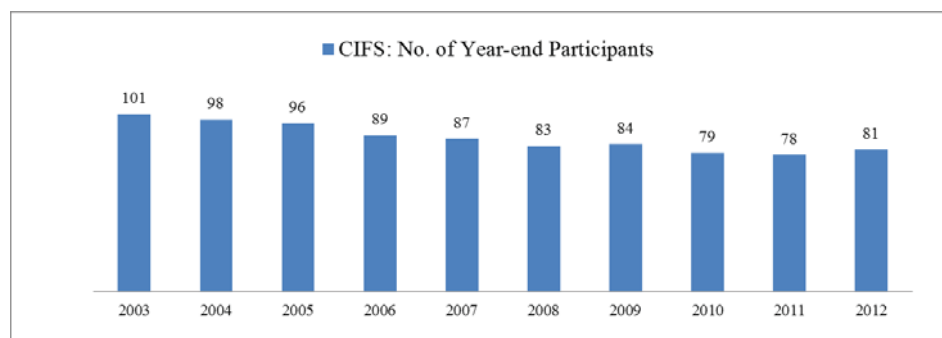
Source: CBC.

Pursuant to the "Directions for the Central Bank of the Republic of China (Chinese Taipei) to Govern Electronic Interbank Funds Transfer and Settlement," financial institutions and clearing institutions are required to obtain the approval of the CBC to establish a computer connection with the CIFS. The clearing institutions refer to the institutions which operate clearing systems carrying out the clearance of check, electronic payments or securities between financial institutions. The approved institutions may hold an account in the CBC and thereby conduct fund transfers. To facilitate the calculation of the CIFS participants, the holder with an effective account in the CIFS is regarded as the CIFS participant[10].

At the end of 2012, there were 81 effective accounts within the CIFS. These accounts belonged to 70 banks, 8 bills finance companies and 3 clearing institutions[11]. The effective accounts of the CIFS have declined somewhat from 2003 to 2012 (Chart 2), mainly due to the mergers of domestic financial institutions or to the exit of foreign banks during 2005-2008.

3.1.2 CIFS Transaction Value

Though the effective accounts decreased as mentioned previously, the annual transaction value of the CIFS increased significantly over the same period (Chart 3). In 2003, its annual transaction value was US$4.67 trillion. Ten years later, the transaction value in 2012 reached US$13 trillion, around 2.8 times of 2003. The most important reasons may be the inclusion of the payment legs from the TDCC-BCS, TWSE-SBECS, GTSM-EBTS, and CGSS in 2004, 2007, 2007 and 2008, respectively, and the increasing settlement value from the FISC-FIS.

---

10. In this regard, though the TCH and the TDCC have their clearing balances settled through the CIFS, these two clearing institutions are excluded in the calculation of the CIFS participants for holding no accounts of the CIFS. By the way, the TCH opened an account in the CIFS since 25th Feb. 2013.

11. They are the FISC, the TWSE and the GTSM.

Chart 3
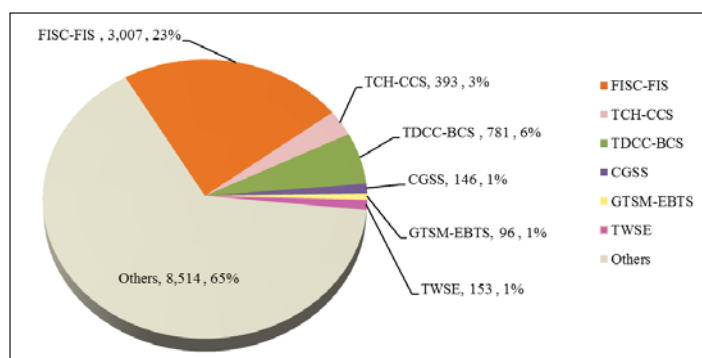**The Annual Transaction Value of the CIFS**
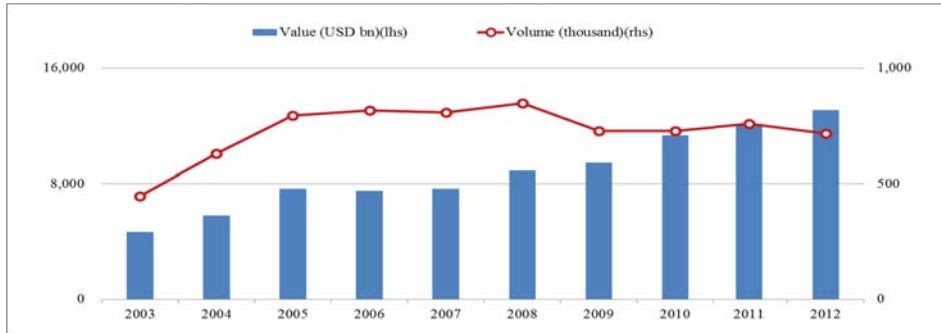
Source: CBC.

3.1.3 System-based Statistics

As mentioned in 3.1.1, the clearing systems carry out the clearance of checks, electronic payments or securities between financial institutions. Therefore, the statistics of the clearing systems such as the CGSS, FISC-FIS, TCH-CCS, TDCC-BCS, TWSE-SBECS and GTSM-EBTS, which have their payments settled through the CIFS, were collected and calculated to facilitate further discussion and analysis for the CIFS.

In addition, for the purpose of monitoring both the intensity of the interdependencies and the trends of the relationship between each clearing system and the CIFS, the settlement value[12] of the CGSS, FISC-FIS, TCH-CCS, TDCC-BCS, TWSE-SBECS and GTSM-EBTS which had been put into the CIFS to settle their transactions either in gross or netting mode, are displayed and discussed in the following sections.

_____

12. Here it refers to the transaction value after clearing and settlement by the CIFS.

284

Chart 4
System-based CIFS Transactions Breakdown in 2012 (US$, billion)

FISC-FIS , 3,007 , 23%
TCH-CCS, 393 , 3%
TDCC-BCS , 781 , 6%
CGSS, 146 , 1%
GTSM-EBTS, 96 , 1%
TWSE, 153 , 1%
Others, 8,514 , 65%

- FISC-FIS
- TCH-CCS
- TDCC-BCS
- CGSS
- GTSM-EBTS
- TWSE
- Others

Source: CBC.

In this regard, a system-based transaction breakdown (disaggregated by the clearing systems) in 2012 of the CIFS is shown in Chart 4. It illustrates that all clearing systems accounted for 35% of the CIFS trasaction value in 2012 upon which the FISC-FIS occupied the highest share of 23%, with the TDCC-BCS ranking the second, 6%, and the TCH-CCS ranking the third, 3%.

On the other hand, the trends of the system-based CIFS transaction value for each clearing system are varied (Chart 5). It appears obviously that the FISC-FIS trended upwards from 2005 to 2012, while the other clearing systems were in a stable movement except the descending trend of the TDCC-BCS during 2008-2009.

Chart 5
System-based CIFS Annual Settlement Amounts (US$, billion)

Source: CBC.

285
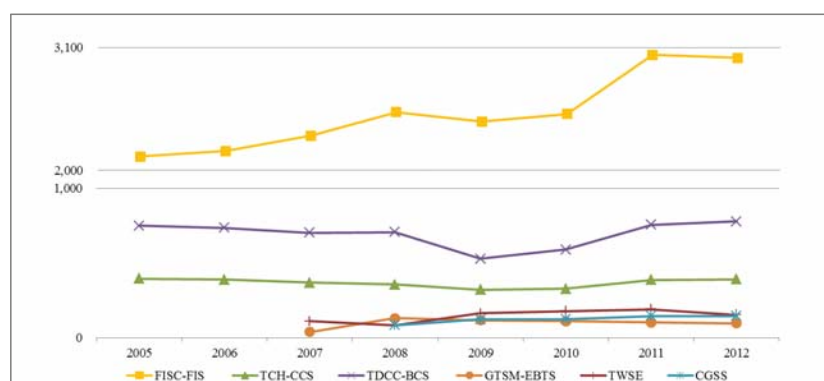
### *3.1.4 Market-wise Statistics*

Further discussion of the CIFS transactions disaggregated by financial markets, i.e., Money Market, Foreign Exchange Market, Bond Market and Securities Market, (hereby named as the market-wise CIFS transactions) will be analysed in the following sections.

Around 49% of the aggregate CIFS transactions can be identified by its resourcing financial markets, with 25% from Money Market, 21% from Foreign Exchange Market[13], 2% from Bond Market and 1% from Securities Market, while the rest 51% transactions were mainly from retail payments, such as the FISC-FIS and the TCH-BCS. The market-wise pie chart of the CIFS are ploted in Chart 6.

Chart 6
Market-wise CIFS Transactions Breakdown in 2012 (US$, billion)
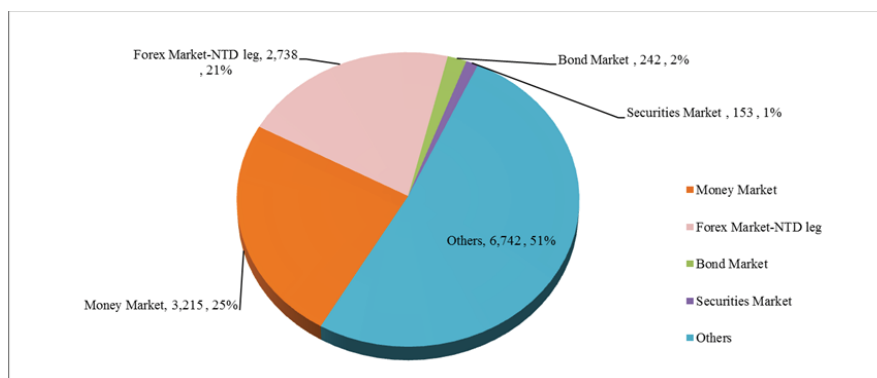
Source: CBC.

Moreover, the annual market-wise CIFS settlement transactions from 2005 to 2012 are depicted in Chart 7. This chart shows the trend of each financial market with regard to the CIFS. It seems obvious that the Money Market made up a heavy share and its influence was increasing. The Foreign Exchange Market was on an upward trend as well. The other markets, Bond and Securities Markets, had trivial impacts on the CIFS and remained stable.

---

13. Since the CIFS deals with NTD settlement only, the Foreign Exchange Market transactions refer to the NTD leg, i.e., the trades between foreign currencies are not added into the calculation.

Chart 7
Market-wise CIFS Annual Settlement Amounts (US$, billion)
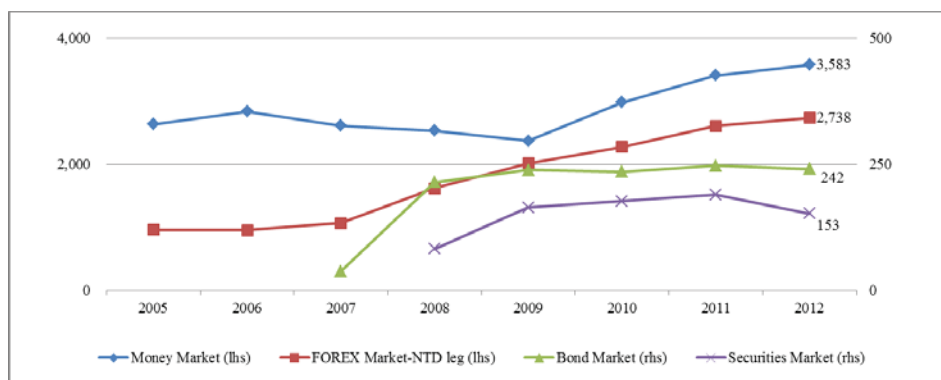
Source: CBC.

3.2 Financial Markets Statistics

To compare with the market-wise statistics of CIFS, the annual financial market transaction value is plotted in Chart 8[14].

Chart 8
Market Annual Transaction Values (US$, billion)
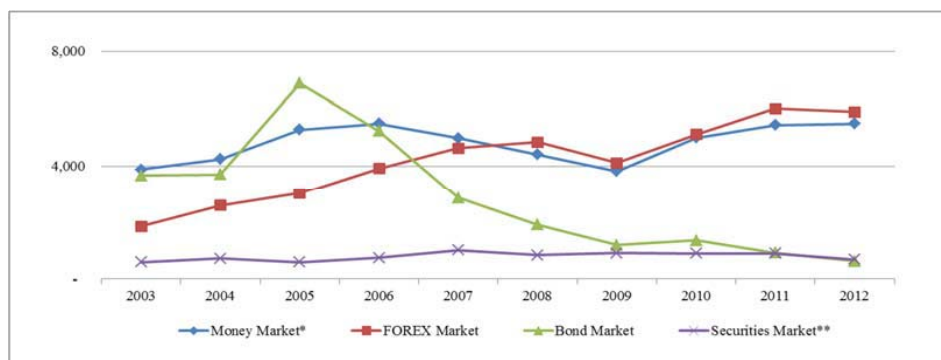
Source: CBC.

**FOREX Market includes spot transaction, forward transaction, swap transaction, cross-currency swap transaction, options transaction and margin trading.

---

14. The relevant monthly data are presented in Appendix 3.

Foreign exchange transaction value continued to grow during 2003-2012, except the plunge in 2009 which "mainly reflected a contraction of international trade and diminishing capital movements. Furthermore, transactions in third currencies decreased because major central banks introduced loose monetary policies to tackle the financial crisis, which narrowed the interest rate spreads between currencies" (Annual Report, CBC, 2009, p.63). On the other hand, the trading amount in the Bond Market expanded in 2005 and then declined during 2006-2012. It seems to reflect that the growth in the domestic Bond Market has hit its new high in 2005, and "as Chinese Taipei's bond markets have entered a mature phase, the trading volume has gradually decreased. Furthermore, during this phase, financial institutions bought and hoarded a great deal of bonds due to ample funds at hand, which resulted in an insufficient supply of bonds and an imbalance of supply and demand in the market, and in turn caused distortions of the government bond yield curve. Additionally, high volatility in the cost of bond borrowing also diminished the trading willingness of market participants. All these are crucial factors that have hindered the development of bond markets" (Financial Stability Report, CBC, 2011, p.70).

3.3 Financial Related Development Indicators

The financial related development indicators herein refer to two groups of indicators, namely financial development indicators and stock market development indicators. Each group is composed of three indicators which will be introduced respectively in the following sections. The financial development indicators are used to gauge the intensity of a country's financial development, while the stock market development indicators are used to assess the progress of a country's stock market development. Furthermore, the level of correlation between these indicators and the CIFS will be demonstrated in next section.

3.3.1 Financial Development Indicators

The financial development indicators comprise the following indicators:

1. *Liqliab* (the sum of M2 divided by nominal GDP) is used to gauge the financial intensity of a country.

2. *Commbank* (the sum of total assets of commercial banks divided by combined assets of commercial banks and the central bank) is used to gauge the degree that banks allocate their credit.

3. *Bankcred* (the ratio of total credit of banks to the private sector by nominal GDP) is used to gauge the level which the credit of banks is allocated to the private sector.

As shown in Table 5, the *Commbank* index remained stable during 2003-2012 while the other two indicators showed an upward trend, which indicate that financial intensity has been improving in Chinese Taipei.

Table 5
Financial Indicators (2003-2012)

Year	CIFS/GDP	Financial Development Indicators			Stock Market Development Indicators		
		Liqliab	Commbank	Bankcred	MktCap	ValTrade	Turnover
2003	15.03	2.00	0.95	1.40	1.20	1.90	1.91
2004	17.04	2.01	0.94	1.47	1.23	2.10	1.77
2005	20.98	2.08	0.93	1.56	1.33	1.60	1.31
2006	19.98	2.10	0.93	1.60	1.58	1.95	1.42
2007	19.52	2.00	0.93	1.56	1.67	2.56	1.53
2008	22.29	2.20	0.94	1.62	0.93	2.07	1.45
2009	25.03	2.35	0.94	1.65	1.69	2.38	1.78
2010	26.45	2.28	0.96	1.63	1.76	2.08	1.37
2011	26.12	2.37	0.96	1.70	1.41	1.92	1.20
2012	27.61	2.39	0.96	1.76	1.52	1.44	0.97
Avg	22.00	2.14	0.95	1.57	1.35	2.00	1.47

Sources: CBC; FSC.

3.3.2 *Stock Market Development Indicators*

The stock market development indicators consist of the following indicators:

1. *MktCap* (total market value of stocks in the domestic market divided by GDP) and *ValTrade* (total market value of stocks being traded by GDP) are used to gauge the scale of stock market.

2. *Turnover* (total market value of stocks being traded divided by the total market value of stocks listed in the domestic market) is used to gauge the level of liquidity in the stock market.

289

As shown in Table 5, *MktCap* was increasing during 2002-2007 and tumbled during the 2008 global financial crisis. Though the index rebounded in 2009, it did not register a positive movement from 2010 to 2012. *ValTrade* also showed a similar trend. *Turnover* seemed to be in a decline during 2003-2012 except a rebound in 2009.

4. Analysis

As described above, the second objective is to investigate the spillover effects of the 2008 financial crisis. While some financial market transactions decreased in 2008, CIFS transactions increased after 2008. The empirical analysis (Section 4.1) shows that the influence on CIFS transactions caused by the domestic Securities Market and Bond Market after the 2008 financial crisis was limited. Following Section 4.1, the discussion in Section 4.2 focuses on the oversight practices and supervisory framework. Finally, a bivariate analysis based on the financial indicators elaborated in Section 3.3 is presented in Section 4.3.

4.1 Event Analysis and Vector Autoregressive (VAR) Model Approach

In Section 4.1.1 we first set up a regression model to identify the determinants explaining the CIFS transactions. Additionally in Section 4.1.2 we employ a structural change model to test if there exists a significant adverse change in the CIFS transactions between the pre- and post-2008 financial crisis periods, and then discuss the possible causes of the structural transition in CIFS's transactions. Finally in Section 4.1.3, we adopt a VAR model to further analyse the interaction relations among the variables of interest.

4.1.1 The Benchmark Model

In this section, the model is set up to explain the determinants of CIFS transactions and test the impacts of market transmitting effects on CIFS. As shown in Chart 6, the four-market flows, FISC-FIS and TCH-CCS settlements account for major shares in relation to CIFS transactions. Therefore, their transaction values are included as independent variables.

Table 6
Data Definition

Data Span	Monthly transaction data from 2003M1 to 2012M12
Variables	Definitions
CIFS	CIFS transaction value, TWD, mn
FISC	FISC-FIS transaction value, TWD, mn
TCH	TCH-CCS transaction value, TWD, mn
MMT	Money Market transaction value, including bills market, RP/RS markets and call loan markets, TWD, mn
FXMT	FX Market net transaction values, USD, times to NT$/US$ monthly exchange rates, mn
BMT	Bond Market transaction values, TWD, mn
SMT	TWSE Stock Market transaction values, TWD, mn

Source: CBC.

The model is set as follows:

$$CIFS = c + \beta_1 FISC + \beta_2 TCH + \beta_3 MMT + \beta_4 FXMT + \beta_5 BMT + \beta_6 SMT + \varepsilon \qquad (1)$$

where, CIFS, FISC and TCH denote the monthly transaction values from 2003M1 to 2012M12. MMT, FXMT, BMT and SMT represent the monthly transaction values of Money Market, Foreign Exchange Market, Bond Market and Securities Market, respectively (see Table 6 for definitions and Appendix 4 & 5 for data figures). To avoid spurious regression, we conduct the Dickey-Fuller GLS test and Phillips-Perron test to investigate the unit root properties prior to the model testing. The results show that nearly all the variables are stationary and significant at 99% confidence interval.

The resulting benchmark model[15] is

$$\widehat{CIFS} = 8.21*10^6 + 1.27 FISC - 5.57 TCH + 0.95 MMT + 0.56 FXMT$$
(se)[16]   (2.22*10^6)***   (0.41)***   (1.03)***   (0.24)***   (0.16)***
$$- 0.32 BMT - 1.05 SMT \qquad \overline{R}^2 = 0.84, Prob\text{(F-stat)} = 0.00$$
(0.07)***   (0.40)***

$$(2)$$

In the benchmark model, it reaffirms that FISC-FIS and TCH-CCS, as systemically important payment systems, are significantly correlated with the

_____

15. For ease of reference, Equation (2) is referred to as "the benchmark model".

16. *** stands for significance at 1% level, **, idem, 5%, *, idem, 10%.

CIFS operations. While FISC-FIS contributes to the CIFS transactions in an ascending trend, the TCH-CCS transactions are negatively correlated to CIFS transactions. That is, although the transactions of CIFS and FISC-FIS have been both increasing steadily in recent years, the TCH-CCS's businesses have been downsizing due to the emergence of electronic payments. Furthermore, the market transmission impacts on CIFS transactions are also significant at 1% level between 2003 and 2012. The Money Market and Foreign Exchange Market correlate positively to the CIFS and the market transactions in these two markets have been increasing since 2008, the same as the CIFS transactions. As to the Bond Market and Securities Market, the transactions are inversely correlated with the CIFS transactions.

4.1.2   *Pre-* and *Post-2008 Effects*

Following the benchmark model, in order to explore the effects of the 2008 global financial crisis that started at the end of 2007, we include a dummy variable to examine whether there exists a structural transition in the CIFS transactions between the pre- and post-2008 periods. Furthermore, in order to determine the appropriate breaking point for the structural change, the Quandt-Andrews breakpoint test is conducted. The test indicates that the structural change happened most likely around 2008M10 to 2009M02 (The test statistic is shown in Appendix 6). Therefore, the dummy variable is set to equal 1 from 2008M10 to 2012M12 and 0 otherwise.

The resulting structural change model[17] is

$$\widehat{CIFS} = 1.38 \text{*} 10^6 + 6.91 \text{*} 10^6 \text{DUMMY} + 1.05 FISC - 2.67 TCH$$

$$\text{(se)} \quad (1.57 \text{*} 10^6) \quad (0.47 \text{*} 10^6)\text{***} \quad\quad (0.25)\text{***} \quad\quad (0.72)\text{***}$$

$$+0.72 MMT + 0.46 FXMT \quad\quad\quad \bar{R}^2 = 0.93, Prob \text{ (F-stat)} = 0.00 \quad\quad (3)$$

$$\quad (0.12)\text{***} \quad\quad (0.10)\text{***}$$

Although the 2008 financial crisis struck some domestic financial markets and its transaction amount was reduced, the significance of the positive dummy variable coefficient indicates there is a positive structural level change in the CIFS transactions between pre- and post-2008 period. The results are valid since the CIFS transactions in Money Market, FISC-FIS and NTD-leg Foreign Exchange Market have increased significantly on average in the post-2008 period compared to the average transactions in pre-2008 period,[18] and the CBC

----

17. For ease of reference, Equation (3) is referred to as the "structural change model".

18 . Since CIFS transactions are mainly composed of Money market, FISC-FIS and NTD-leg Foreign Exchange market transactions, the significant positive incremental is partly due to their average transaction increases in the post-2008 period (refer to Chart 5 and Chart 7).

incorporated the GTSM-EBTS, TWSE-SBECS and CGSS into CIFS in 2007 and 2008. After we include the dummy variable in the structural change model, the MMT and FXMT remain significant at 1% level, yet the BMKT and SMT both become insignificant,[19] suggesting that the transmission effects of 2008 global financial crisis on Chinese Taipei's Securities Market and Bond Market linked to CIFS were negligible.

Two points are worth noting. First, the structural reforms of CIFS (e.g., to provide final settlement services for other systems) may be more significant than the transmitting effects from Bond market and Securities market. The reasons are as follows: compared to the benchmark model, the inclusion of dummy variable trivialised the influences from the two markets in the above structural change model, where the impacts of structural reforms are captured by the dummy variable. Second, the transmitting effects from the Money market and Foreign Exchange market into CIFS are more essential than the influences from the Bond market and Securities market. This also makes sense because the transactions in the Money market and NTD-leg Foreign Exchange market account for significant shares in CIFS transactions (see Chart 6).

### 4.1.3 Vector Autoregressive (VAR)[20] Model Approach

In consideration of the dynamic relations in time series, we then conduct a Vector Autoregressive (VAR) model to further explore the interconnection relationships among the concerned variables in Section 4.1.1. The monthly data were used in the VAR model with the following ordering: FISC, TCH, FXMT, MMT, SMT, BMT and CIFS. Based on Akaike Information Criterion (AIC) test, the optimal period of lag order is selected as twelve. The resultant analysis of the impulse response and variance decomposition is, then, shown below.

In the first place, the resultant analysis of impulse response was displayed in Chart 9. It is obvious that the response results are stably varied around zero after the first period within the standard error bands. Furthermore, it showed that the responses of CIFS to FISC were positive and with the largest effect at the first period, dying off and stably fluctuating around zero over time. Additionally, the response of the CIFS to MMT was also comparatively large at the first period. For other variables, the responses of CIFS were slightly varied around zero. In other words, this demonstrates that the effects of other variables' shocks on CIFS were limited based on the historical data series.

––––––––––––––––

19. The test results of the complete model are presented in Appendix 7.

20. Please see Bernanke & Blinder, (1992).

Chart 9
The Impulse Response Analysis
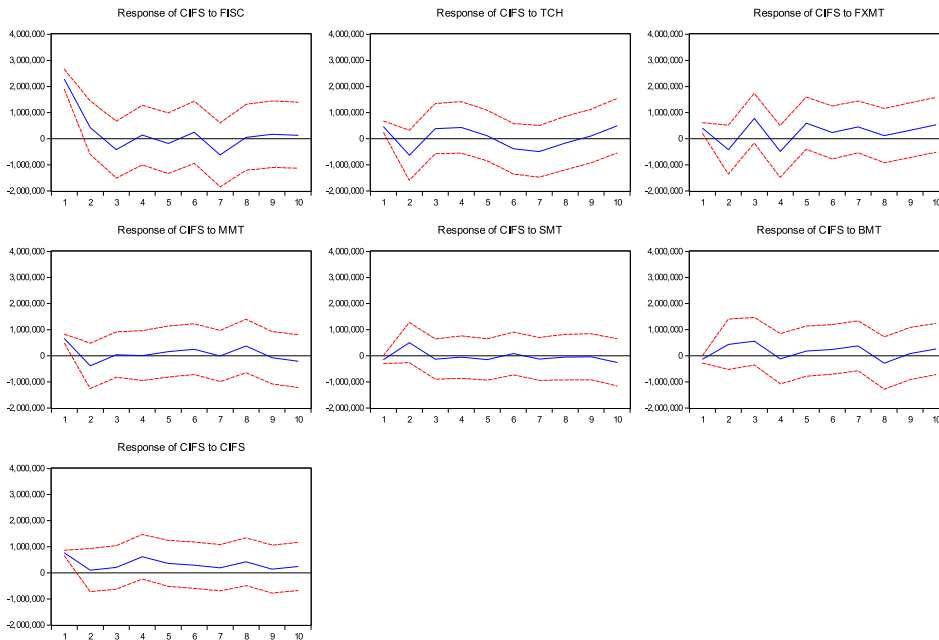
Secondly, the empirical study demonstrates the percentage of variance decomposition of the forecast error of variables to CIFS. It helps to understand the degree of the change a variable could be explained by itself or other endogenous variables and judge the strength of each variable's exogeneity. The results are shown in Table 7. The empirical result indicated that in terms of the variance of CIFS transactions, FISC transactions had considerably high explanatory power (44.66%~78.53%). For both FXMT and CIFS, the longer the period, the higher the explanatory power to its variance. The explanatory power could reach at most 16.12% and 11.40% for FXMT and CIFS, respectively.

In sum, from the above analysis, FISC, FXMT, and MMT are influential factors in explaining the variation of CIFS transactions, which is consistent with the previous analysis in Section 4.1.

Table 7
The Results of Variance Decomposition

Variance Decomposition of CIFS						
Period	FISC	TCH	FXMT	MMT	SMT	BMT	CIFS
1	78.53	3.14	2.47	6.49	0.31	0.27	8.79
2	67.24	7.71	4.29	7.24	3.45	2.66	7.41
3	59.66	8.20	10.31	6.24	3.14	5.64	6.82
4	54.93	9.35	11.78	5.72	2.91	5.30	10.00
5	52.13	8.94	14.38	5.64	2.95	5.30	10.66
6	50.45	9.90	14.25	5.95	2.89	5.59	10.96
7	49.39	11.03	14.71	5.45	2.77	6.31	10.35
8	47.65	10.87	14.29	6.37	2.69	6.72	11.40
9	47.21	10.80	14.91	6.33	2.67	6.69	11.39
10	44.66	11.96	16.12	6.28	2.98	6.81	11.19

Cholesky Ordering: FISC TCH FXMT MMT SMT BMT CIFS

4.2 Bivariate Analysis

To examine the relationship between the transaction value of RTGS and financial market, a covariance analysis over CIFS/GDP with financial related development indicators (mentioned in Section 3.3) is conducted and discussed in the following sections. The results are shown in Table 8, which suggest that the financial development indicators have a more robust relationship with the CIFS than the stock market development indicators.

4.2.1 Correlation between CIFS/GDP and Financial Development Indicators

Table 8
Covariance Analysis (2003M01:2012M12)

Correlation (t-Statistic)	CIFS/GDP	Financial Development Indicators			Stock Market Development Indicators		
		Liqliab	Commbank	Bankcred	MktCap	ValTrade	Turnover
CIFS/GDP	1.00 –––						
Liqliab	0.77 (12.99)***	1.00 ––––					
Commbank	0.38 (4.43)***	0.47 (5.75)***	1.00 –––				
Bankcred	0.74 (12.07)***	0.90 (22.65)***	0.25 (2.84)***	1.00 ––––			
MktCap	0.50 (6.32)***	0.38 (4.52)***	0.14 (1.51)	0.52 (6.69)***	1.00 –––		
ValTrade	0.03 (0.34)	-0.08 (-0.89)	-0.06 (-0.73)	-0.08 (-0.87)	0.40 (4.71)***	1.00 –––	
Turnover	-0.26 (-2.94)***	-0.29 (-3.30)***	-0.10 (-1.07)	-0.39 (-4.57)***	-0.15 (-1.65)	0.83 (16.37)***	1.00 –––

Note: *means significance at 10% level. **, idem, 5%. ***, idem, 1%.Source: CBC; FSC.

Table 8 indicates that the CIFS/GDP is positively correlated with all of the three financial development indicators within 1% level of significance. The coefficients between the CIFS/GDP and *Liqliab*, *Commbank* and *Bankcred* are 0.77, 0.38, and 0.74, respectively. Moreover, these three indicators are positively correlated with each other within 1% level of significance. The statistics to some extent suggest that positive relationships exist between the CIFS transaction value and domestic financial intensity, the level of banks' credit allocated to the private sector and the ratio of banks assets to the combined assets of commercial banks and the central bank (in the order of correlation level).

4.2.2 Correlation between CIFS/GDP and Stock Market Development Indicators

Though the correlation between the CIFS/GDP and financial development indicators are significant, yet similar results are apparently not applicable to the stock market development indicators. Within the stock market development indicators, two indicators are within 1% level of significance. Only *MktCap* is

positively correlated (0.5). The other one, *Turnover*, is negatively correlated (-0.26). Besides, the results of covariance analysis are mixed in the cross correlation within these three stock market development indicators.

4.3 Discussion on FMI Oversight and Supervisory Framework

To be in line with the development of global trends with the developed countries establishing single financial supervisory authorities to consolidate the supervision of financial institutions and markets, the FSC was established on 1 July 2004 as the competent authority responsible for development, supervision, regulation, and examination of financial markets and financial service enterprises in Chinese Taipei.

In general, the FSC is regarded as the main supervisory authority for financial markets and financial institutions while the CBC is the competent authority in charge of the oversight of payment systems pursuant to Article 2 of the Organic Act Governing the Establishment of the Financial Supervisory Commission, as mentioned in Section 2.3.

The CBC coordinates with the FSC on the oversight and supervision of FMIs to minimise duplication, particularly for payment systems. The CBC and the FSC exchange views and both establish information-sharing arrangements so as to achieve public policy objectives. In this regard, the CBC holds "Promotion for the Sound Operation of Payment Systems" meetings regularly with the FSC, the TDCC, the FISC and the TCH.

In addition, "to help cross-strait cooperation, the FSC signed three MOUs, involving banking, insurance, and securities and futures services, with the China Banking Regulatory Commission, the China Insurance Regulatory Commission and the China Securities Regulatory Commission, respectively, on 16 November 2009. The content of these MOUs covered supervisory cooperation including information exchanges, confidentiality, financial examinations, and cross-strait contacts. The terms were effective as of 16 January 2010" (CBC, 2010, p. 80). These MOUs are expected to contribute to the collaboration of cross-strait supervision. Moreover, the coordination may support Chinese Taipei's supervisory authorities to obtain a more complete picture of the relevant activities of Chinese Taipei's financial institutions in China.

5. Conclusion

The BIS-CPSS reports, namely, "The Interdependencies of Payment and Settlement Systems" (2008) and "Principles for Financial Market Infrastructures" (2012) serve as the important sources and research motives of this paper. Derived from these reports, this paper tries to examine the interdependencies between FMIs and the CIFS, and how they were influenced through the interdependencies when some shock events occurred, such as the 2008 global financial crisis. Above all, this paper locates the CIFS in the center of discussion since the CIFS is the most systemically important FMI in Chinese Taipei, and any disruption or impacts on the CIFS can result in systemic risk to financial markets.

Some important statistics of the CIFS in Section 3 are worth noting. Firstly, the CIFS transaction value is on an upward trend during 2003-2012, probably due to the inclusion of the payments from TDCC, TWSE, GTSM and CGSS. Secondly, when we disaggregate CIFS transaction value in 2012 by system (Chart 4) and by market (Chart 6), the level of interdependencies (if both financial markets and systems are put into consideration) seems easy to tell. Overall, the Money Market shares the most (25%), with FISC-FIS (23%) the next, and the third, Foreign Exchange Market (21%). These statistics to some extent explain the interdependencies between the CIFS and other systems (and financial markets).

The benchmark model is employed using monthly data ranging from 2003M1 to 2012M12 to identify the factors influencing the CIFS transaction value. The empirical results are consistent with the previous statistics. The major influential factors are FISC-FIS, Money Market and Foreign Exchange Market transactions. We further include a dummy variable in the regression model to capture the effects of structural change in CIFS transactions. The significance of the positive dummy variable coefficient indicates a positive structural level change in the CIFS transactions between pre- and post-2008 periods. The reasons may be the increasing transactions in Money Market, FISC-FIS and Foreign Exchange Market as well as the recent CIFS reforms to provide final settlement services to other systems. Accordingly, since the positive incremental in CIFS transactions is statistically significant, the transmitting effects of the 2008 financial crisis on CIFS transactions seem to be negligible. On the other hand, the VAR analysis reaffirms that FISC-FIS, Foreign Exchange Market and Money Market transactions are important factors in explaining the variation of CIFS transactions. Furthermore, a covariance analysis between the CIFS transaction value and financial indicators is conducted and the results show that the CIFS is positively correlated with financial development indicators within 1% level of significance,

while the relationship between the CIFS and stock market development indicators are vague.

Regarding the oversight of the CBC, to ensure smooth and efficient operation of significant payment systems, the CBC has requested the FISC and the TCH to conduct self-assessment against the "Core Principles for Systemically Important Payment Systems" published by BIS-CPSS in 2001 and reviewed their assessment results. Since both the statistics and the regression results suggest that the FISC became the most critical FMI in terms of the system-based interdependencies of the CIFS, the safety and efficiency of the FISC should be proportionately emphasised. Though the CBC oversees the FISC, the FSC remains the regulatory authority. Thus, cooperation for the supervision of systemic FMIs between the CBC and the FSC, such as regular meetings and information sharing, becomes essential. In this regard, we suggest that both authorities coordinate more closely on specific issues such as requesting systemic FMIs to conduct self-assessments against the "Principles for Financial Market Infrastructures" and share the reviewed results so as to enhance sound operation of these FMIs and efficiency of supervision.

Finally, as the hub of domestic FMIs, some data of the CIFS are still presented in raw data form which needs to be processed, disaggregated and calculated before analysis. Therefore, we suggest that the CIFS build up a data base which can be more user-friendly to facilitate further research and analysis.

References

Bernanke and Blinder, (1992), "The Federal Funds Rate and the Channels of Monetary Transmission," *American Economic Review*, Volume 82, Issue 4, September, pp. 901-921.

Committee on Payment and Settlement Systems (CPSS), (2001), Bank for International Settlements, "Core Principles for Systemically Important Payment Systems," January.

Committee on Payment and Settlement Systems (CPSS), (2008), Bank for International Settlements, "The Interdependencies of Payment and Settlement Systems," June.

Committee on Payment and Settlement Systems (CPSS), (2012), Bank for International Settlements, "Principles for Financial Market Infrastructures: Disclosure framework and Assessment Methodology," December.

Central Bank, Chinese Taipei (CBC), (2009), Annual Report.

Central Bank, Chinese Taipei (CBC), (2010), Annual Report.

Central Bank, Chinese Taipei (CBC), (2011), Annual Report.

Central Bank, Chinese Taipei, (CBC) (2008), "Financial Stability Report," Issue No. 1, June.

Central Bank, Chinese Taipei (CBC), (2008), "Financial Stability Report," Issue No. 2, December.

Central Bank, Chinese Taipei (CBC), (2009), "Financial Stability Report," Issue No. 3, May.

Central Bank, Chinese Taipei (CBC), (2010), "Financial Stability Report," Issue No. 4, May.

Central Bank, Chinese Taipei, (CBC) (2011), "Financial Stability Report," Issue No. 5, May.

Central Bank, Chinese Taipei (CBC), (2012), "Financial Stability Report," Issue No. 6, May.

Central Bank, Chinese Taipei (CBC), (2013), "Financial Stability Report", Issue No. 7, May.

Central Bank, Chinese Taipei (CBC), (2010), "The Payment and Settlement Systems in the Chinese Taipei," October.

Miao, Wei-Cheng, (2011), "The Role of Trade Financing in Chinese Taipei's Exports during Subprime Crisis with an Assessment of Counter-Crisis Policies," SEACEN Report.

List of Abbreviations

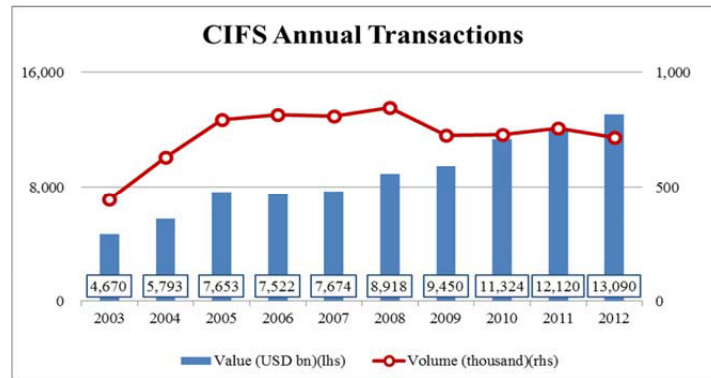| CBC	Central Bank, Chinese Taipei
CCP	Central Counterparty
CIFS	CBC Interbank Funds Transfer System
CGSS	Central Government Securities Settlement System
CSD	Central Securities Depository
FISC	Financial Information Service Corporation
FISC-FIS	Financial Information System of Financial Information Service Corporation
FMI	Financial Market Infrastructure
FSC	Financial Supervisory Commission
GTSM	GreTai Securities Market
GTSM-EBTS	Electronic Bond Trading System of the GreTai Securities Market
PS	Payment System
SSS	Securities Settlement System
TCH	Taiwan Clearing House
TCH-CCS	The Check Clearing System of the Taiwan Clearing House
TDCC	Taiwan Depository and Clearing Corporation
TDCC-BCS	Bills Clearing System of Taiwan Depository and Clearing Corporation
TR	Trade Repository
TWSE	Taiwan Stock Exchange
TWSE-SBECS	Securities Book Entry Clearing System of Taiwan Stock Exchange

<div align="right">

Appendix 1

</div>

Stylised Statistics of Chinese Taipei's Economy in 2012

Stylised Statistics of Participating SEACEN Members' Economy									
SN	Economy GDP (mill. $)	Pop (mil.)	Area (sq. km)	GT	KA	EI	FD	PST	PS
Chinese Taipei	474,269	23	36,000	A	C	1.40	1.76	37.26	27.61
Note: 1. "Economy (in US $ dollars)" in 2012; 2. "Population (in millions)" in 2012; 3. "Area (square kilometers)"; 4. "GT" is Geographical type A. Island, B. Landlocked C. Neither A or B; 5. "KA" is Capital Account A. Not liberalised B. Partially liberalised C. Fully liberalised; 6. External Integration ("EI") indicator is (X of goods and services + M of goods and services)/GDP; in 2012; 7. Financial Development ("FD") indicator is the ratio of total credit of commercial banks and other deposit-taking banks to the private sector by nominal GDP in 2012; 8. Payment System Total ("PST") Transaction Indicator is total transactions (including CIFS, FISC -FIS and TCH -CCS) by GDP in 2012; 9. The CIFS transaction by GDP in 2012									

Source: Directorate-General of Budget, Accounting and Statistics, Executive Yuan, Chinese Taipei; CBC.

Annual Transactions of Systemically Important Settlement and Clearing Systems
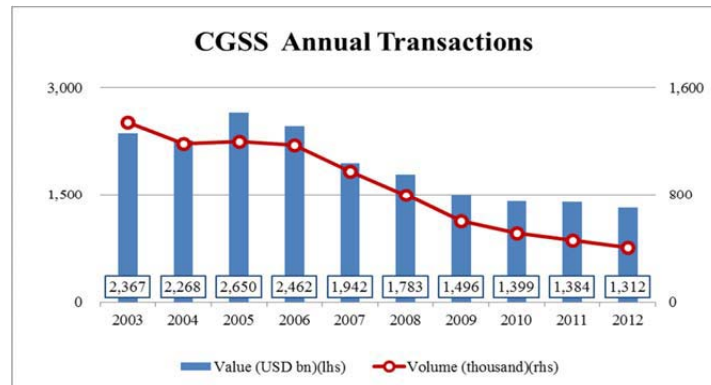
Source: CBC.
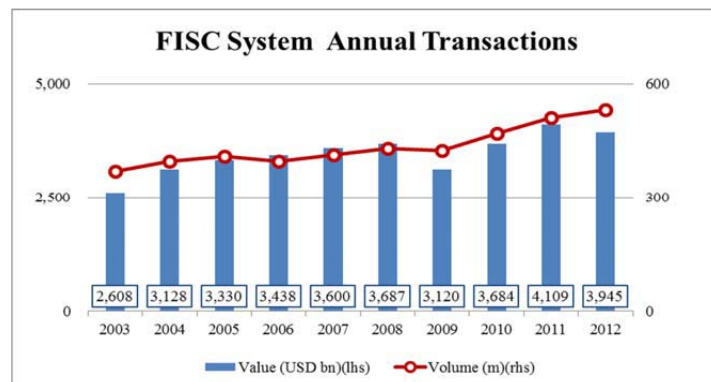
Source: CBC.

Source: CBC.

TCH-CCS Annual Transactions

Source: CBC.

TDCC Annual Transactions

Source: TDCC.

GTSM-EBTS Transaction Value of Outright Trades of Gov. Securities

Source: GTSM.

305

TWSE-listed Stock Annual Transactions

Year	Value (NTD tn)(lhs)
2003	20
2004	24
2005	19
2006	24
2007	33
2008	26
2009	30
2010	28
2011	26
2012	20

Source: CBC.

GTSM-listed Stock Annual Transactions

Year	Value (NTD bn)(lhs)
2003	2059.3
2004	3475.44
2005	3166.45
2006	5129.11
2007	8537.39
2008	3285.46
2009	5238.95
2010	5633.58
2011	3993.03
2012	2951.9047

Source: FSC.

306

The Relevant Data Set

SEACEN Research Project: "Analytical Framework in Assessing Systemic Financial Market Infrastructur										
		Draft Data Form								
PS name	**CIFS**									
	2003	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Transaction value (USD bn)	4,670	5,793	7,653	7,522	7,674	8,918	9,450	11,324	12,120	13,090
		Annual Market Transaction Value in USD bn								
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Money Market*	3,885	4,243	5,275	5,481	4,982	4,403	3,819	4,991	5,445	5,484
FOREX Market	1,838	2,580	3,009	3,911	4,634	4,846	4,111	5,115	6,013	5,893
Bond Market	3,673	3,700	6,891	5,225	2,852	1,905	1,190	1,344	913	622
Securities Market*	592	716	584	736	1,007	835	900	894	891	684
	Note:									
	*Include RP/RS, Call loan market, and both buying and selling trades in Bill Market **Include only listed stocks									

SEACEN Research Project: "Analytical Framework in Assessing Systemic Financial Market Infrastructure							
Draft Data Form							
Name of Payment System (PS):		The Central Bank's Interbank Funds Transfer System (CIFS)					
		AVG	STD	2003M01	2003M02	2003M03	2003M04
No. of PS transactions		60,605	10,972	39,418	28,556	36,528	38,095
Value of PS transactions (USD, Million)		735,716	229,054	481,894	306,534	335,383	349,943
Transaction Values (USD, million)		High Frequency Market Price Value of transactions in USD (highest time series, from 2003 or latest available)					
		AVG	STD	2003M01	2003M02	2003M03	2003M04
	Money Market*	400,059	68,685	330,694	238,824	318,624	341,694
	FOREX Market	349,589	119,564	132,773	100,305	134,831	141,446
	Bond Market	235,947	183,016	257,454	200,626	283,698	414,051
	Securities Market**	65,315	22,541	60,744	27,701	27,490	33,888
		*Include RP/RS, Call loan market, and both buying and selling trades in Bill Market **Include only listed stocks					

2003M05	2003M06	2003M07	2003M08	2003M09	2003M10	2003M11	2003M12	2004M01	2004M02
37,100	35,368	39,086	36,410	38,342	42,419	35,604	39,598	33,115	38,188
362,507	366,387	402,952	384,337	411,195	468,271	382,094	421,651	396,494	384,711
2003M05	2003M06	2003M07	2003M08	2003M09	2003M10	2003M11	2003M12	2004M01	2004M02
352,957	326,922	342,602	317,261	311,207	340,061	315,770	348,822	257,965	309,377
146,491	143,875	169,654	154,333	196,427	208,785	146,294	162,485	189,592	210,140
486,349	436,952	349,753	238,906	174,411	308,028	231,335	291,044	194,447	184,778
28,397	58,289	85,441	60,722	50,762	67,083	49,233	41,912	54,223	95,617

2004M03	2004M04	2004M05	2004M06	2004M07	2004M08	2004M09	2004M10	2004M11	2004M12
45,268	46,820	50,200	54,228	58,131	57,696	58,679	57,144	64,072	66,389
472,726	467,530	454,367	467,500	487,560	470,301	515,545	473,681	546,738	664,218
2004M03	2004M04	2004M05	2004M06	2004M07	2004M08	2004M09	2004M10	2004M11	2004M12
377,840	359,829	332,483	354,089	383,996	364,094	363,896	334,246	367,854	437,416
232,837	226,268	224,692	212,597	203,491	177,288	195,360	208,148	243,446	256,097
369,503	353,718	250,972	247,640	378,321	291,545	261,170	347,360	411,311	409,066
111,625	95,497	55,298	43,311	34,378	36,377	51,026	48,427	46,615	43,135

2005M01	2005M02	2005M03	2005M04	2005M05	2005M06	2005M07	2005M08	2005M09	2005M10
66,511	46,420	73,493	63,950	62,176	65,543	68,830	70,588	72,699	64,765
672,592	491,046	712,322	648,108	600,875	662,931	691,802	648,139	627,278	627,255
2005M01	2005M02	2005M03	2005M04	2005M05	2005M06	2005M07	2005M08	2005M09	2005M10
424,744	283,130	451,551	405,882	446,800	463,886	457,263	479,191	466,769	438,219
234,346	177,001	272,641	228,777	225,553	256,794	258,726	271,786	264,209	249,288
499,972	263,245	450,243	510,564	672,416	511,738	743,806	831,056	623,848	795,411
36,166	35,511	53,829	37,820	41,823	58,085	59,061	53,771	41,574	42,265

2005M11	2005M12	2006M01	2006M02	2006M03	2006M04	2006M05	2006M06	2006M07	2006M08
66,697	72,516	69,512	58,496	75,934	66,853	72,902	72,380	68,067	70,687
597,487	674,711	704,049	534,275	677,759	661,153	648,722	645,816	664,734	629,570

2005M11	2005M12	2006M01	2006M02	2006M03	2006M04	2006M05	2006M06	2006M07	2006M08
451,878	505,277	474,322	405,241	522,315	479,909	501,289	483,175	463,291	468,232
254,635	314,911	283,364	249,400	327,375	288,450	337,901	344,001	321,316	343,792
584,363	403,937	589,613	506,967	623,965	421,797	275,593	368,259	414,334	473,793
51,280	72,835	67,385	48,672	63,598	72,230	87,249	60,897	45,074	51,894

2006M09	2006M10	2006M11	2006M12	2007M01	2007M02	2007M03	2007M04	2007M05	2007M06
64,759	62,588	68,069	66,761	70,723	46,662	70,311	61,080	68,136	65,152
567,900	627,552	575,253	586,551	672,998	437,933	612,038	564,758	588,629	625,838

2006M09	2006M10	2006M11	2006M12	2007M01	2007M02	2007M03	2007M04	2007M05	2007M06
416,047	410,455	418,602	438,490	477,984	271,903	449,779	425,881	457,611	439,283
346,294	328,583	381,850	358,513	408,619	278,223	439,539	332,873	387,376	358,925
432,245	372,460	430,521	315,336	441,692	146,772	461,348	283,823	320,602	172,027
47,458	49,621	70,893	70,817	80,269	33,218	78,030	63,852	63,295	90,152

2007M07	2007M08	2007M09	2007M10	2007M11	2007M12	2008M01	2008M02	2008M03	2008M04
68,488	75,745	62,442	74,844	74,468	69,915	75,927	57,921	75,870	72,827
686,538	746,316	599,970	727,949	715,007	699,954	769,266	600,955	807,362	778,702

2007M07	2007M08	2007M09	2007M10	2007M11	2007M12	2008M01	2008M02	2008M03	2008M04
445,774	444,636	363,377	400,845	400,148	405,194	408,419	293,770	408,767	414,884
393,440	438,051	341,801	440,552	472,953	341,935	463,801	343,320	486,555	425,740
192,549	196,455	149,646	181,685	150,602	154,335	238,312	153,635	304,474	262,058
150,980	107,471	74,967	107,210	89,843	67,643	94,460	57,612	104,423	108,587

2008M05	2008M06	2008M07	2008M08	2008M09	2008M10	2008M11	2008M12	2009M01	2009M02
73,900	70,779	69,478	71,251	75,079	75,595	61,972	66,773	51,872	59,074
761,885	762,679	766,610	753,018	756,610	846,092	609,437	716,473	552,979	691,475
2008M05	**2008M06**	**2008M07**	**2008M08**	**2008M09**	**2008M10**	**2008M11**	**2008M12**	**2009M01**	**2009M02**
398,199	374,180	379,233	351,168	364,610	370,597	289,998	348,858	237,932	269,645
414,378	400,656	408,843	382,468	472,092	494,008	270,813	283,707	235,322	272,351
153,252	136,620	87,626	125,496	128,010	99,534	94,359	121,290	84,335	104,847
96,397	66,628	72,453	62,639	58,572	38,143	33,634	41,717	25,383	38,193

2009M03	2009M04	2009M05	2009M06	2009M07	2009M08	2009M09	2009M10	2009M11	2009M12
65,144	61,896	55,702	66,548	64,586	59,312	60,701	61,519	58,710	61,470
752,015	655,438	674,060	898,250	861,054	812,350	839,941	929,521	863,052	940,559
2009M03	**2009M04**	**2009M05**	**2009M06**	**2009M07**	**2009M08**	**2009M09**	**2009M10**	**2009M11**	**2009M12**
287,969	282,865	267,904	347,899	330,139	329,860	349,393	384,797	349,322	380,797
324,743	326,238	316,750	367,033	350,487	334,174	390,761	419,592	394,887	378,955
132,409	94,846	100,935	108,924	122,077	92,502	107,391	107,909	65,137	68,427
67,257	92,959	105,127	86,764	92,112	63,750	81,024	85,958	70,632	91,293

2010M01	2010M02	2010M03	2010M04	2010M05	2010M06	2010M07	2010M08	2010M09	2010M10
56,991	46,025	63,319	59,463	63,105	62,513	61,856	62,063	60,762	62,291
868,040	722,789	920,984	889,803	1,007,018	897,214	967,370	1,043,108	954,896	965,236
2010M01	**2010M02**	**2010M03**	**2010M04**	**2010M05**	**2010M06**	**2010M07**	**2010M08**	**2010M09**	**2010M10**
348,935	283,070	411,747	388,963	449,825	380,532	423,541	473,488	426,583	431,946
405,861	317,607	443,291	436,487	473,112	402,100	429,643	443,348	443,641	442,518
139,485	54,494	115,213	142,269	154,032	124,148	143,695	130,776	91,325	100,111
93,516	40,715	72,949	81,515	62,103	51,820	69,495	85,305	82,768	77,100

2010M11	2010M12	2011M01	2011M02	2011M03	2011M04	2011M05	2011M06	2011M07
64,148	65,516	65,145	49,496	69,956	60,923	64,863	63,343	61,027
1,021,188	1,077,685	1,149,806	832,030	1,070,134	981,568	984,074	1,021,009	1,067,199

2010M11	2010M12	2011M01	2011M02	2011M03	2011M04	2011M05	2011M06	2011M07
481,284	490,745	503,480	360,340	505,508	449,217	465,614	451,930	476,360
440,651	436,837	483,478	360,831	517,172	459,101	512,419	542,482	514,015
90,131	58,679	92,376	69,465	96,877	60,211	80,030	88,083	80,793
75,694	100,586	88,519	64,933	89,154	73,427	75,407	71,608	84,370

2011M08	2011M09	2011M10	2011M11	2011M12	2012M01	2012M02	2012M03	2012M04
68,212	66,382	60,476	65,082	62,765	51,751	60,635	64,678	56,772
1,139,306	992,059	968,876	942,064	977,151	900,176	1,074,421	1,123,766	1,082,552

2011M08	2011M09	2011M10	2011M11	2011M12	2012M01	2012M02	2012M03	2012M04
503,870	430,788	415,108	430,607	451,949	347,485	433,154	495,218	474,843
633,594	561,292	519,912	495,389	413,670	406,005	492,890	531,590	472,443
89,105	99,753	61,875	49,139	45,608	41,894	62,135	66,373	59,834
100,863	71,805	60,058	62,817	47,924	45,006	94,034	77,709	51,404

2012M05	2012M06	2012M07	2012M08	2012M09	2012M10	2012M11	2012M12	2013M1
65,143	61,890	63,145	62,142	58,635	60,443	58,030	54,039	61,714
1,133,662	1,076,523	1,134,529	1,139,149	1,043,242	1,153,469	1,119,599	1,114,070	1,237,836

2012M05	2012M06	2012M07	2012M08	2012M09	2012M10	2012M11	2012M12	2013M1
478,445	460,764	482,856	484,340	430,262	498,549	463,722	433,941	414,208
575,068	507,508	506,590	492,608	490,576	499,796	485,900	432,199	645,676
52,850	56,681	66,292	44,633	42,775	50,758	47,541	30,383	66,999
54,366	44,656	48,422	55,577	57,605	47,243	51,830	55,858	58,830

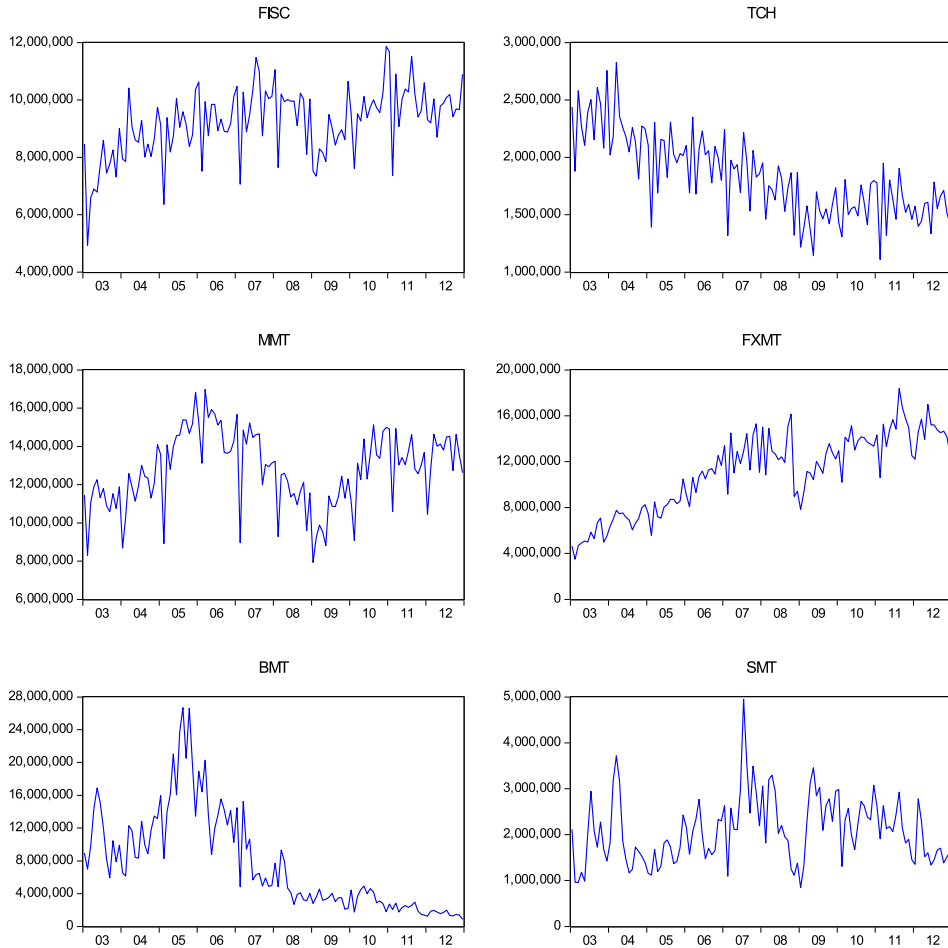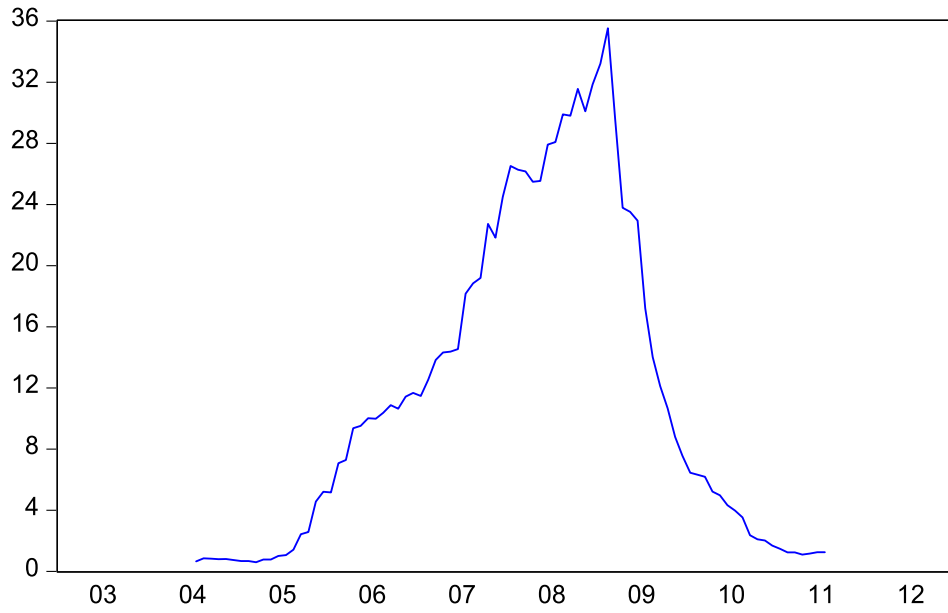**Dependent Variable: CIFS Transaction Value (2003M1:2012M12)**
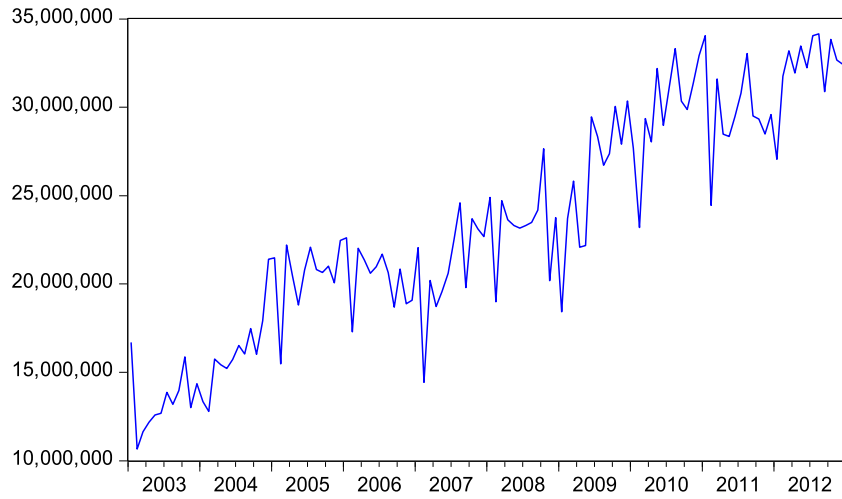
Independent Variables of the Benchmark Model (2003M1:2012M12)

The Resulting Test Statistics of the Quandt-Andrews Test

The Test Results of the Complete Model

Dependent Variable: CIFS

Method: Least Squares

Date: 07/07/12   Time: 22:09

Sample: 2003M01 2012M12

Included observations: 120

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1399204.	1567931.	0.892389	0.3741
DUMMY	6394046.	526430.5	12.14604	0.0000
FISC	1.173819	0.273064	4.298689	0.0000
TCH	-2.611297	0.721074	-3.621400	0.0004
MMT	0.743731	0.156538	4.751118	0.0000
FXMT	0.450723	0.107236	4.203112	0.0001
BMT	-0.047972	0.051150	-0.937865	0.3503
SMT	-0.461745	0.265330	-1.740266	0.0846

R-squared	0.933359	Mean dependent var	23286372
Adjusted R-squared	0.929194	S.D. dependent var	6328289.
S.E. of regression	1683921.	Akaike info criterion	31.57549
Sum squared resid	3.18E+14	Schwarz criterion	31.76132
Log likelihood	-1886.529	Hannan-Quinn criter.	31.65096
F-statistic	224.0924	Durbin-Watson stat	0.719710
Prob(F-statistic)	0.000000		

Chapter 10

ANALYTICAL FRAMEWORK FOR ASSESSING THE SYSTEMIC FINANCIAL MARKET INFRASTRUCTURE IN VIETNAM

By
Trong Vi Ngo[1]
and
Anh Hoang Ly[2]

1.   Introduction

1.1 Motivation

Vietnam's financial and payment systems are considered to be the least developed systems among the countries in the SEACEN region, as Vietnam did not initiate full-scale financial reforms until the middle of the 1990s[3]. It must be understood that the Vietnamese are apt to mistrust banking systems, because of their hard experiences of wars and financial crunches. The banking system has been underdeveloped and cash has been the most commonly used payment instrument. U.S. dollars are widely accepted for payment of goods and services, to the extent that they are estimated to make up nearly 30% of the money supply in Vietnam. As described above, Vietnam began its financial reforms in the mid-1990s, and its electronic payment systems have recently made rapid progress. Banks have begun installing ATMs and issuing credit cards, which are gradually becoming widespread. A stock exchange was established in 2000, although transactions are still limited in volume and value. Financial sector reform is recognised as the key to achieving high growth, reducing poverty and transforming Vietnam's economy into a market-based one. However, the explosive

growth of Vietnam's stock market over the period from 2005 to 2007, as well as the impact of the financial crisis and economic recession in the U.S. in 2007/2008 on Vietnam's economy have highlighted the urgent need to upgrade the FMIs and to strengthen financial sector supervision in order to avoid potential financial contagion.

1.2 Vietnam – Country Profile

Vietnam is a densely populated developing economy transitioning from the rigidities of being a centrally planned since 1986. Vietnam joined the World Trade Organisation (WTO) in January 2007 and became an official negotiating partner in the Trans-Pacific Partnership Trade Agreement (TPP) in 2010, moves which have promoted more competitive, export-driven industries. State-owned enterprises account for roughly 40% of the GDP, while agriculture's share of economic output continued to shrink from about 25% in 2000 to less than 22% in 2012. Industry's share increased from 36% to nearly 41% in the same period due to the commitment to economic modernisation in recent years by the Vietnamese authorities [Central Intelligence Agency (CIA), 2013]. The population was around 90.4 million in 2013, and the unemployment rate of the population of working age was around 2% in 2013 (see Table 1.1). Poverty has declined significantly; macroeconomic stability and economic growth have definitely led to increased employment to meet the challenge of a labour force that is growing by more than one million people a year Following the global financial crisis of 2007/2008, the global recession hurt Vietnam's export-oriented economy, with GDP growth in the period from 2009 to 2012 attaining less than the 7% per annum average achieved during the previous decade (it fell from 6.8% in 2000 to 5% in 2012). In 2012, the budget deficit was -3.9% and public debt was 48.2% of GDP. However, exports were US$114.6 billion and increased by more than 12% a year; several administrative actions brought the trade deficit back into balance. This is also considered to be a result of the prospects of economic recovery in the key economies around the world.

318

Table 1.1
Stylised Statistics of the Economy of Vietnam

	Economy	Population	Area	GT	KA	EI	FD	PST	PS
	1	2	3	4	5	6	7	8	9
2011	328,958	87.8	**Total: 331,210** Land: 310,070 Water: 21,140	C	B	162.9% Export/GDP: 79.4% Import/GDP: 83.5%	110.2	590%	590%
2012	**354,953**	**88.8**				**156.5% Export/GDP: 80% Import/GDP: 76.5%**	**104.9**	**548%**	**548%**
2013	375,008	90.4				151.2% Export/GDP: 80.5% Import/GDP: 70.7%	114.2	519%	519%

Note: (1) Economy is in million US$ (GDP at PPP, current international dollars); (2) Population is in millions; (3) Area is in square kilometres; (4) "GT" is Geographical Type (A. Island; B. Landlocked; C. Neither A or B); (5) "KA" is Capital Account (A. Not liberalised; B. Partially liberalised; C. Fully liberalised); (6) "EI" is External Integration indicator (Export of goods and services + Import of goods and services)/GDP; (7) "FD" is Financial Development indicator (Domestic credit provided by banking sector, % of GDP); (8) "PST" is Payment System Total (Transaction Indicator is total transactions in the economy by GDP); (9) "PS" is the component of PST above, where if there is only one payment system then figure for PST and PS will be the same and it is total transactions in the economy by GDP.
Source: ADB (2014).

Between 2008 and 2011, Vietnam's managed currency, the dong (VND), was devalued in excess of 20% (VND per US$ increased from 16,548 in 2008 to 18,612 in 2010 and to 21,036 in 2013), but its value remained stable in 2012 and 2013 (CIA, 2013). Foreign direct investment inflows fell by 4.5% of GDP to US$10.5 billion in 2012. Foreign donors pledged US$6.5 billion in new development assistance for 2013. In February 2011, the government shifted its policy away from policies aimed at achieving a high rate of economic growth, which had stoked inflation, to one aimed at stabilising the economy (aimed at achieving price stability by an inflation target), through tighter monetary and fiscal control. In early 2012, Vietnam unveiled a broad, three-pillar economic reform programme, proposing the restructuring of public investment, state-owned enterprises and the banking sector. Vietnam's economy continues to face challenges from an undercapitalised banking sector, as well as a high inflation rate. First, the non-performing loans (NPLs) weigh heavily on banks and businesses. The official bad debt ratio climbed to 8.8% in September 2012, though some financial analysts believe it could have been as high as 15%. Second, inflation in Vietnam has been a serious issue in the past, but has recently declined and was recorded at around 6% in 2013. From 1996 to 2013, it averaged 7.36%, but at its highest was 28.24% in August 2008 (it was running substantially higher

319

elsewhere in frontier and emerging markets) and lowest at 2.6% in July 2000. Inflation climbed to around 23% again in 2011, due to the impact of external shocks on domestic economy but they were exacerbated by loose macroeconomic policies, such as a pro-growth policy stance, resulting in easy money and excessive fiscal stimulus. Therefore, the modest growth rate 5.5% in 2013 (lower than the 5.9% in 2001 and the 6-6.5% targeted by the government) reflects the bad debts, poor infrastructure and weak corporate governance of Vietnamese enterprises.

1.3 Objectives

The main purpose of this research is to provide in-depth analysis and possible explanations of how interdependency affects the capacity, transparency, efficiency and systemic stability of the financial markets. It aims to shed light on the role of FMIs in risk management in order to improve financial market and macroeconomic stability, as well as to reduce the damage from international financial contagion.

1.4 Outline

The paper consists of five sections, including the Introduction (Section 1). Section 2 provides a comprehensive review and assessment of the stylised facts and interdependency of FMIs in Vietnam. Section 3 investigates some important issues regarding the interdependency of FMIs in order to cast new light on their roles in avoiding and reducing certain systemic impacts and damage from international financial contagion. Section 4 conducts an investigation to examine the effects of interdependency on the capacity, transparency, efficiency and systemic stability of the financial markets. Section 5 summarises the key findings and recommendations, discusses their limitations and suggests some ideas for further research.

2. Financial Market Infrastructure in Vietnam

2.1 General Policy and Regulation Framework in Vietnam

Vietnam's financial markets have grown rapidly with over-dependence on the credit of the banking sector and the improvement of the payment system during the last decade. In order to avoid damage from potential financial contagion, as well as to secure sufficient stable and sustainable development, the government has put considerable effort into developing the financial markets and FMIs. The financial system has been developed from its mono-banking system, in which the state-owned policy finance bank assumed authority and responsibility in many

different financial and banking functions until the early 1990s, to a market principle-based system. The State Bank of Vietnam (SBV) was formerly responsible for all banking functions, but has now become the central bank of Vietnam, with only financial policy and supervisory authority and responsibilities. There have also been significant improvements in the legal framework, supervision system and regime regarding the financial markets (see Table 2.1). Although the regulations and supervision may sometimes still be unclear and make financial intermediaries and authorities interpret the regulations differently, overall, the financial market is consistently moving towards international standards.

Table 2.1
Financial Market Supervision System

Financial Markets	Supervising Authorities	Legal Framework
Securities Market, Securities Companies, Stock Exchange	State Securities Committee (SSC)	Law on Securities (Law No.70/2006/QH11 and Amended Law No. 62/2010/QH12)
Insurance Market	Insurance Supervision Department [Ministry of Finance (MOF)]	MOF's Decision 288/2009
Bonds Market (Corporate Bond Issuance)	Banks and Financial Institutions Department (MOF)	Law on Securities MOF's Decision 2456/2009 Decree No.91/2011/NĐ-CP
Banks and other Credit Institutions	State Bank of Vietnam (SBV)	Law on Credit Institutions
Overall Financial Markets	National Financial Supervisory Commission	Prime Minister's Decision 34/2008

Source: Le (2008) and Nguyen (2012).

2.2 Stylised Facts of the FMIs in Vietnam

According to BIS (2012) and MAS (2013), the 24 principles of five types[4] of FMIs can be broken down into two broad categories: (i) the payment system (PS), for the first type, and (ii) the capital market system, for the remaining four types. Therefore, we next investigate the payment and capital market systems in order to establish the main stylised facts about FMIs in Vietnam.

---

4. There are five types of FMIs: payment systems (PSs), central securities depositories (CSDs), securities settlement systems (SSSs), central counterparties (CCPs) and trade repositories (TRs). The 24 principles establish the latest international benchmark for the regulation, governance and risk management of systemically important FMIs (BIS, 2012). For more details on the general applicability of the 24 principles to specific types of FMIs, see Table 1 (page 14) of BIS (2012).

2.2.1 Payment System

The payment system in Vietnam, sometimes called the inter-bank payments system, includes paper-based payment system (PBP) and electronic payment system (EPS). Transactions were carried out on a paper basis before the introduction of the electronic system.[5] In this system, each province has one branch of SBV that manages the provincial payment centre in order to facilitate the balance of payments between commercial banks through their current account with the central bank. The electronic payment system was installed in July 2002 to replace the paper-based one. However, it requires the maintenance and improvement of its legal frameworks towards international standards. It has been reformed under the Payment System and Bank Modernisation Project (it was run by the World Bank since May 2002 and closed in June 2011) in order to improve the speed and reliability of interbank payments from two weeks in 2005 to within the day (or on real time). This project is composed of seven sub-projects, the core of which is the construction of an electronic payment system developed by Hyundai Information Technology (HIT) (of South Korea) with the incremental approach towards technical solution design and implementation (MOFJ, 2009). The other six projects include modernisation of the internal systems of commercial banks. SBV regards the accomplishment of these seven sub-projects as having the following purposes and effects: (1) modernisation of the interbank payment system; (2) online connection with all branches of all commercial banks; (3) inclusion of all commercial transactions; (4) inclusion of all cash flows; (5) to be used for the implementation of government financial policies, and inclusion of all government banking transactions; (6) increased user-friendliness for customers of commercial banks; and (7) usefulness in contribution to Vietnam's economic development, via all the items above.

The payment system is defined in the central banking law, which mandates its management by the SBV. According to this law, the SBV is responsible for the interbank payment system and for the supervision of the internal payment systems of commercial banks. The domestic telecommunications system is based on an X.25 network connection, managed by Vietnam Posts and Telecommunications (VNPT) and is designed to match the infrastructure. The provincial payment centres are in charge of intra-province payments. Commercial banks transmit inter-province payments to the National Processing and Settlement Centre (NPSC), through which they are re-sent to member banks. The intra-province payments account for 75–85% of all remittances. The rest are inter-

---

5. Most interbank payments took days (2 weeks) to settle a transaction under the old systems which could not provide timely information for risk management.

province payments handled by the NPSC. Remittances are processed using the electronic inter-bank payment system, which deals with an average of 7,000 transactions per day (MOFJ, 2009). Clearly, the electronic payment system has had a positive effect on the financial market. It enables commercial banks to quickly send and receive funds, improving predictability of cash flows in the economy, as well as access to finance of bankable but under-banked households and enterprises. The internal system can handle a daily average of 7,500 remittances and it can process intra-branch funds transfers within two seconds (MOFJ, 2009). It is said that the development of the internal system has made substantive contribution to the development of the interbank payment system. Based on the positive impact of this project, the government has adopted a strategy to promote a non-cash economy. Therefore, commercial banks have emphasised the increase in ATMs and non-cash payment instruments as one of their main financial strategies. The infrastructure development made available timely information for the SBV to monitor market liquidity and for commercial banks to manage risks.

2.2.2 Capital Market System

The capital market system includes the stock market and the bond market. For stock-trading settlement, customers open accounts with securities companies and bank accounts at the Ho Chi Minh City Branch of Joint Stock Commercial Bank for Investment and Development of *Vietnam* (BIDV). The Stock Trading Centre (STC)[6] was in charge of settlements of securities, and BIDV provides services for cash payments of all securities transactions (See Figure 2.2). When securities are traded, purchased securities are deposited into customers' accounts with securities companies, and BIDV debits customers' bank accounts for payments (see Appendix A). Customers are able to trade stocks by remitting funds from other BIDV's branches to its Ho Chi Minh City branch. Compared with the stock market, Vietnam's bond market is undeveloped. There are two types of bonds: government bonds and corporate debentures. Government bonds[7] are issued by the MOF or SBV, but their outstanding balances are undisclosed. Corporate debentures are very limited, because only one corporate issue is listed at the Ho Chi Minh City Stock Exchange (HOSE). The aggregate market value

––––––––––––––––

6. STC was established in 2000 and considered as a part of SSC. It used to have two separate functions: securities dealings and settlements until SSC reassigned securities settlement from STC to the Vietnam Securities Depository (VSD).

7. They are in three different types depending on their maturities and target potential investors: (i) direct issuance at all provincial branches of MOF or SBV, (ii) issuance visa STC and (iii) issuance by auction to institutional investors.

of issued bonds is estimated to be about US$300 million, although this varies according to source materials. Decree No.01/2000/ND-CP provides that the National Treasury Bureau of the MOF has overall responsibility for managing government bonds. As described above, the issuance of the government bonds is complicated. Booking and settlement proceedings are not unified, and are controlled using decentralised management methods. Therefore, the MOF has been developing a new system for the management and settlement of government bonds, in collaboration with domestic software vendors. It is now working hard towards live operations. The current system of HOSE, developed in collaboration with South Korea and Thailand, does not always satisfy its members. The STC is planning to develop a new system for securities trading and safekeeping, in collaboration with the ADB. Development of new securities management software is a future issue of the SBV. There are no link between systems or between securities settlements and cash payments. Preparation for such links is vital, in light of increased volumes of securities transactions, as well as in consideration of future increases in demand for liquidity.

When Vietnam begins to plan full-scale capital market, it will be imperative to seek new securities settlement and payment systems (including back-office operations and cash payments), in tandem with the development of a new stock trading system, for the pursuit of the long-term development of the capital market. Since governmental financial institutions do not have enough funding resources and technical capacities to develop standardised securities systems, some commercial banks are making individual efforts to develop their own systems which are not fulfilling the requirements for the standard of the industry. These systems may cause difficulties in their future integration. In this context, making a master plan for securities settlement systems - as in the development of electronic payment systems - is very important, in order to reduce significant development costs and to avoid discordance and inconformity between these systems in the future integration.

Moreover, international payments are partly deregulated in Vietnam. The receipt of funds remitted from foreign countries has been liberalised, but remittances to foreign counties are strictly controlled, requiring many documents as evidence of reasons for such offshore payments. Payment and receipt of funds for capital accounts are usually prohibited and require government authorisation. International payments are usually subject to the same methods as used in other countries and commercial banks have correspondence agreements with overseas banks and access to SWIFT. They implement electronic banking

and manage online their overseas deposit accounts due from foreign correspondent banks and also offer electronic banking services for local currency (dong) accounts.

2.3 Mapping the Interdependency of FMIs in Vietnam

The interbank electronic payment system (IBPS) is composed of two sub-systems: the High-value Sub-system (HVTS), for large-amount remittances on a gross basis, and the Low-value Sub-system (LVTS) for small-amount remittances on a net basis (See Figure 2.1). This system is based on the Korean Inter-bank Payment System (KIPS), and was developed by the HIT (see Figure 2.1). This system was installed in July 2002 in order to replace the paper-based system and it was maintained and improved by recent development of the legal frameworks (Le, 2008).

Figure 2.1
Interbank Electronic Payment System of Vietnam
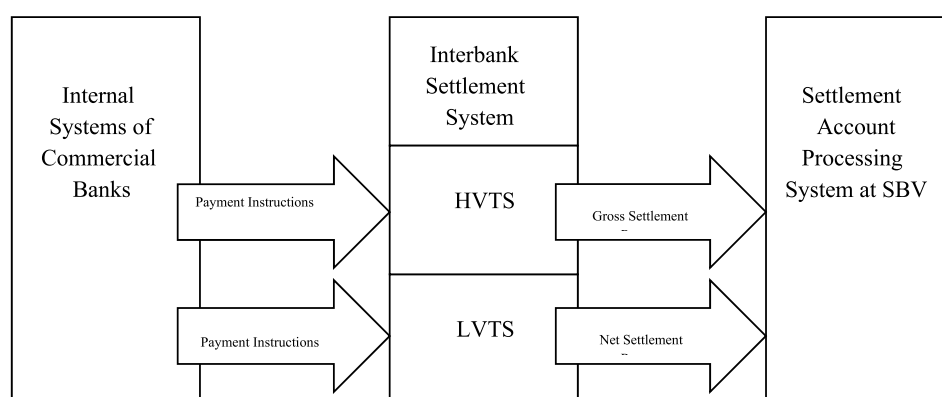
Source: MOFJ (2009).

Remittances of 500 million dong (US$24,000) or more are handled by the HVTS, while those of smaller amounts are handled by the LVTS. However, commercial banks tend to send all remittances through the HVTS. The payment instructions via the LVTS are balanced out on net basis at the end of business hours via transfers of the SBV settlement accounts of member banks. On the other hand, funds are immediately transferred via the HVTS if there are sufficient balances in settlement accounts or stored in a system queue and will be sequentially processed when settlement accounts shortfalls are replenished (MOFJ, 2009). In

addition, funds will reach the branches of the receiving banks within 10 seconds. Over the past few years, the IBPS created the backbone and has made great contribution to the development of the capital market.

When securities are traded, as we have already mentioned, the settlements of securities are provided by the VSD while the cash payments of all securities transactions are provided by the BIDV (see Figure 2.2). Other payments are carried out through the IBPS (see Figure 2.1). All the evidence points to the fact that there exists a complex set of interactions between the payment and capital market systems. Therefore, it makes it difficult to predict the level of systemic risk and to prevent financial contagion that might occur in a financial network. This suggests that integrated financial markets dominate the contagion effects.

Figure 2.2
Securities Settlement Infrastructure in Vietnam

Note: Definition of trade date is different from other countries in Viet Nam since trade date is regarded as the date when securities are traded on stock exchange (in case of listed securities) or date when traded data are entered to HNX system (in case of trade registered securities). But, actual trade is agreed on OTC market before the date.
BIDV = Bank for Investment and Development of Vietnam; HOSE = Ho Chi Minh Stock Exchange; HNX = The Hanoi Stock Exchange; VSD = Vietnam Securities Depository
Source: ABMF SF2.

Source: ADB (2012).

2.4 Oversight and Supervisory Authority of FMIs in Vietnam

The MOF and SBV jointly regulate the capital market (see Figure 2.3). The SBV is the chief regulatory body for all issues affecting the banking industry, while the MOF is considered as a government agency and is responsible for regulation of banks and non-bank institutions and participating in the management of the stock market (see Table 2.2). The SSC reports to the MOF and regulates

the securities market. The HOSE, Ha Noi Stock Exchange (HNX) and VSD are under the SSC jurisdiction and are required to adhere to the regulations relating to accounting, auditing, and statistical reporting.

Figure 2.3
Vietnam Market Regulatory Structure
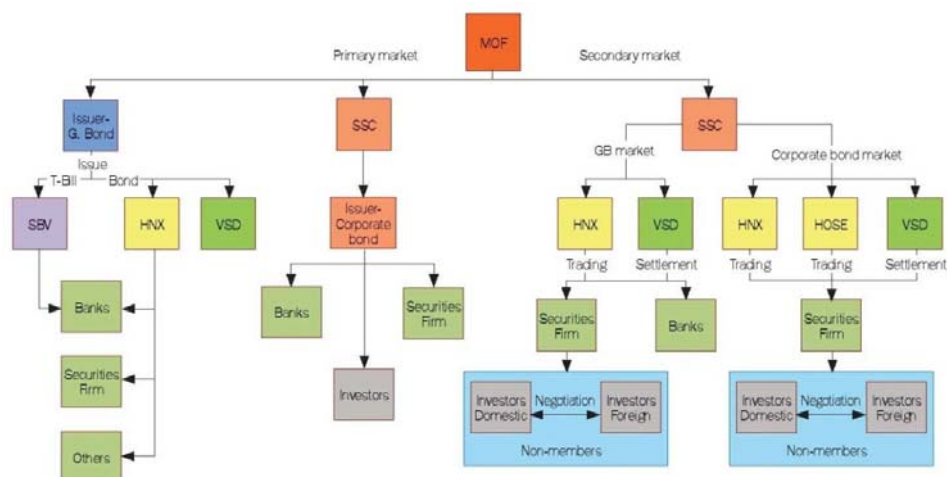
Source: ADB (2012, 2013).

Table 2.2
Oversight and Supervisory Authority of FMIs in Vietnam

SN	FMI Type	Ownership	FMI	Authorisation, Designation or Licensing	Oversight	Supervision	Onsite Inspection
1	PS	Public/Private	PBP EPS X2.5	SBV	SBV	SBV	SBV
2	CSD	Public		MOF	SSC	SSC	MOF
3	SSS	Private		Designation	SBV MOF	SBV MOF SSC	SBV MOF
4	CCP	n.a.					
5	TR	n.a.					

Source: ADB (2012, 2013).

3. Financial Statistics from Vietnam

Over the past several years, financial globalisation, which is defined as global linkages through cross-border financial flows, has been the fundamental driving force and is the most decisive aspect of globalisation. It has made emerging markets integrate financially with the rest of the world and is characterised by a dramatic growth in the volume of cross-border flows. It has proceeded based on the self-regulatory capacity of markets, without adequate structures and systems to govern. Therefore, it leads to the appearance of large cracks, which threaten the stability of the world economy such as the global financial crisis. In particular, regarding the financial crisis of 2007/2008, the stock markets had fallen rapidly. Large financial institutions collapsed or were bought out, and governments were compelled to devise rescue packages in order to bail out their financial systems. The results show that FMIs are playing an increasing active role in reducing the damages from financial contagion (the spread of financial market turmoil across countries). This section aims to present the interconnectedness between the FMIs and the financial system to investigate the interdependency of the FMIs and the contagion effects of systemic FMIs.

3.1 Bond Market

The bond market has improved significantly since the first international bond issuance in October 2005, due to the reform of the existing legal framework. Local government bonds have been issued in large lots, and corporate bond issuance has tended to be eased by streamlined procedures. Instruments consist of bonds issued by the government and by private enterprises (including commercial banks). Government bonds are also used for open market operations (OMO) and are the main securities for repurchase transactions. They dominate the debt market, followed by municipal bonds and then corporate bonds. Bonds are typically purchased at initial auctions by insurance companies, commercial banks and individuals and are held until maturity, which varies from less than 1 to 15 years. The participants include issuers from the government and corporate sectors. Investors include commercial banks and domestic life insurance companies, authorised securities companies and a few market associations (ADB, 2013) (See Table 3.1). However, the global credit rating agencies (CRAs) have successfully entered the bond market in recent years while there are no domestic ones in Vietnam.

Table 3.1
Vietnam's Bond Market Participants

Participants	
Issuers	Government and corporate
Investors	Major commercial banks, domestic life insurance companies, authorised securities companies, other institutional investors, and a few market associations.
Intermediaries	Securities companies and foreign banks (custodian banks)
Rating Agencies	Stand & Poor's (S&P, 06/06/2012), Rating and Investment Information (R&I, 01/03/2013), Fitch Ratings (29/01/2013)
Market Associations	Vietnam Securities Business Association (VSBA), Viet Nam Association of Financial Investors (VAFI) and Vietnam Bond Market Association (VBMA)

Source: ADB (2013).

Figure 3.1
Vietnam's Bond Yield versus FX Movement
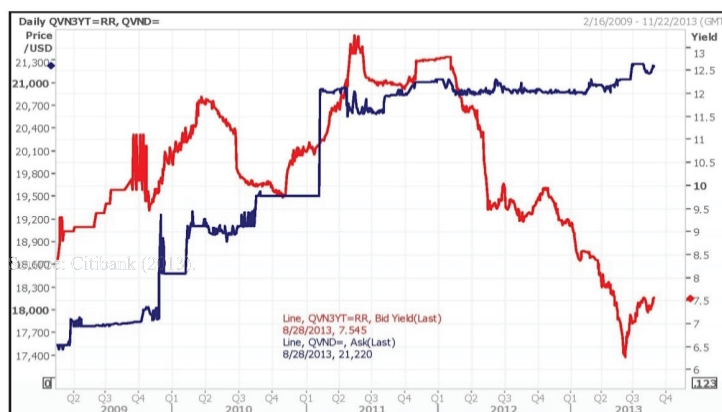
Source: Citibank (2013).

HOSE and HNX are the main distribution and trading platforms; they are financially self-managed entities under the regulation and supervision of the SSC. Depository, registration, clearing and settlement operations take place at the VSD, which is currently operating under the SSC and will eventually be restructured into a joint-stock or limited liability company. The bond market is also governed by the MOF and the SBV. Cash clearing is settled by the designated clearing bank (BIDV) and securities are settled through the VSD (the settlement cycle is T+1). In order to avoid and reduce repercussions of the systemic risks that

may affect the safety and soundness of the financial market, critical reforms have been carried out by focusing on the demand and supply of securities, market intermediaries and infrastructure, and the legal and regulatory framework. Investors have tended to favour the local currency bonds in recent years, since the exchange rate has been kept within the trading bank after VND devaluation, while the interest rate has been reduced slightly by the SBV (see Figure 3.1).

3.2 Stock Market

Table 3.2
Vietnam's Financial Market Participants, 2013

FMIs		Listed Shares	Participants		
			Total	Firms	Number
Payment System	HVTS	n.a.	34	Central Bank	01
				Commercial Banks	33
Bonds Market	HOSE	38	2	Government	1
				Corporate	1
				Commercial Banks	1
	HNX	507	1	Government	1
				Corporate	0
				Commercial Banks	0
Securities Market	HOSE	301	301	Listed Companies	301
				Commercial Banks	5
	HNX	377	377	Listed Companies	377
				Commercial Banks	3
Others	HOSE	2[(*)]	2	Investment Funds	2
	HNX	0	0	Investment Funds	0
Total	HOSE	341	305		
	HNX	884	378		
	PS	n.a.	34		

Note: (*): Investment Fund Certificates (IFCs).
Source: HOSE (2014), SSC (2014) and HNX (2014).

The VN-Index averaged 505.60 points from 2013 until 2014, reaching an all time high of 509.10 points and a record low of 504.51 points in January 2014. The stock market has increased the total number of companies listed on HOSE (including two Investment Fund Certificates) to 303, from two when it opened in 2000, and to 377 listed on HNX (SSC, 2014; Trading Economics, 2014) (See Table 3.2). The VN-Index increased by 16% in 2013, the best increases in Asia from the beginning of 2013[8], although it slumped by 27% in 2011[9] and continued

---

8. The global crisis started to manifest its effects in the real economy in the middle of 2007. The effects have so far remained under-examined, probably because of the difficulty in making an assessment. Therefore, it is predicted that the impact is still being felt, five years on.

9. The slump on the securities market in 2011 made Vietnam become Asia's worst performer.

to drop by 11% in the second and third quarters of 2012 (see Figure 3.2). The market is forecast to continue its upward trend in 2014 and the upcoming years since stocks are still much cheaper than those in many other regional markets. It has become the most important reason why investors have been convinced to start investing in stocks now.

Figure 3.2
Vietnam Securities Market Indicators
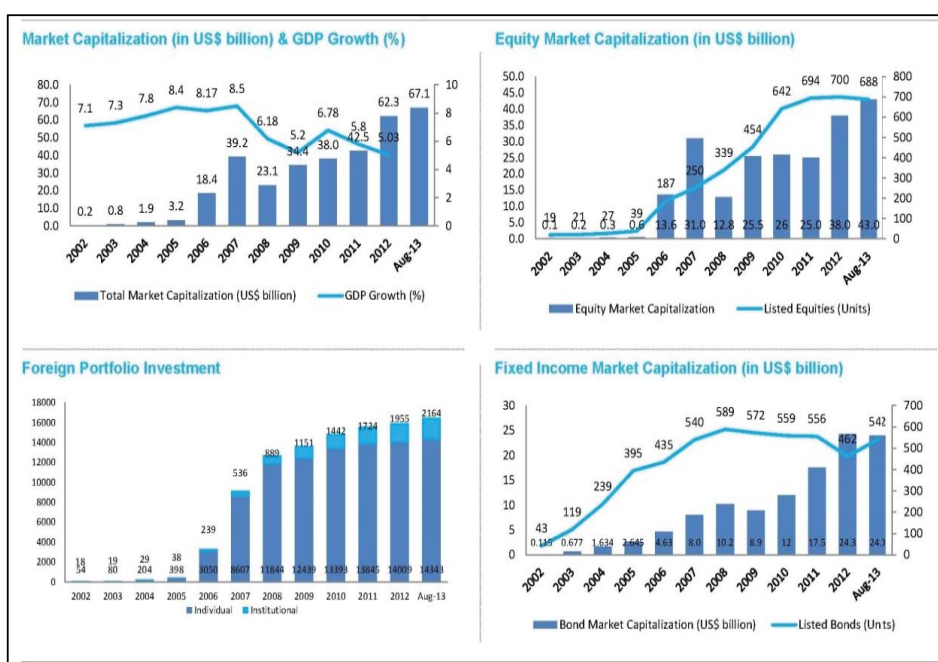
Source: Citibank (2013).

The Government issued a decree guiding the Law on Securities and its amendment which provide regulations on offshore listing, listing of depository receipts and foreign securities, as well as on the real-estates investment fund. The MOF issued regulations on establishing and managing exchanged-traded funds (ETF) on December 2012 (effective from 1 September 2013), and new regulations guiding pension insurance and voluntary pension funds on August 2013 (effective from 15 October 2013). The new regulations provided the legal framework for the introduction of new financial instruments to bring more investment options and instruments to investors and to align Vietnam's securities market with international standards. Furthermore, several infrastructure

331

enhancements have been launched to upgrade the trading system in order to expand its capacity of handling 20 times the current volume, facilitate the periodic order matching session and new types of trading orders, and allow investors to amend prices and volumes. Clearly, the enhancements of the trading system will help increase market liquidity in order to achieve stabilisation and growth. Therefore, the financial market, as well as the banking system, is predicted to recover over the next few years. This finding is consistent with previous studies (BIS, 2012; BOE, 2013; BOC, 2013) which have demonstrated the key role of FMI in the smooth functioning of the economy, the stability of markets and financial stability.

Risks typically arise from transactions between the participants in markets which are different to the FMIs since the FMIs are sets of rules, contracts, processes and operational managements for managing, reducing, allocating and mitigating risks (including systemic risks). In general, there are three main types of infrastructure overseen by the central bank with a view of protecting and enhancing the stability of the financial system: PS, SSS and CCPs (BOE, 2013). First, the PS enables lending and repayment, allows businesses to receive payments, and facilitates the payment of salaries and benefits to the general public. Second, the SSS enables the purchase and sale of stocks and bonds. Third, the CCPs offer their guarantee to the participants in the market that transactions in a range of financial and commodity markets will be honoured, even if the original counterparty defaults. In the particular case of Vietnam, we have investigated the interdependency of the FMIs by examining the interconnectedness between the payment and securities settlement systems.

Figure 2.2 and Table 3.2 shows that commercial banks perform various primary functions in the case of the financial market (including issuers, investors and intermediaries). The importance of the BIDV to the banking system and financial market cannot be understated. Perhaps, even more important than other commercial banks, the BIDV operates as a settlement bank[10] and performs certain functions that in other countries are carried out only by the central bank. In addition, the term commercial bank is often used to distinguish it from an investment bank due to differences in bank regulations. In recent years, many of the leading commercial banks offer some range of investment banking services, whereas investment banks were limited to capital markets activities. Therefore, the separation between commercial and investment banks needs to be repealed. Due to its role as a sort of the central bank, its profitability is not as good as that of

––––––––––––––––

10. Nearly all securities transactions carried out in the stock markets are cleared through the BIDV when the stock markets opened until now.

other large commercial banks since it has potentially more exposure to the bad debts of the state-owned enterprises.[11] According to the expansion of the lending activities (i.e. the credit growth speed), bad debts are always risks along with the operations of the banking system. It is argued that the NPLs in the financial sector is considered as an obverse mirror image of ailing, unprofitable enterprises and one of the major causes of the economic stagnation problems, hindering the economic growth and impairing the economic efficiency. It can lead to efficiency problem of the banking sector and to the financial crisis.

3.3   FMI Statistics from Vietnam

The slowdown in the global economy has led to falls in growth in the developing economies from 2009 until now. The Vietnamese economy was strongly affected by the global financial crisis. Consequently, customer sentiment was adversely affected and the VN-Index kept falling. In order to mitigate the scale and depth of the recession, large scale counter-cyclical policy packages were put in place, together with liquidity injections into the financial system, restructuring and management oversight. There has been significant movement in the direction of less bureaucracy, more transparency and efficiency. Figure 3.2 and Table 3.3 show that the value of the stocks transactions increased by 31%, and the VN-Index increased by over 22% in 2013, compared to the year before. The average trading volume per session reached VND 2,578 billion, primarily due to the trading of government bonds; the average government bond transactions reached VND 1,257 billion per day and the average trading stocks or funds reached VND 1,322 billion per day, a slight increase of 1.5% compared to 2012 (SSC, 2013; VnEconomy, 2013; MOFVN, 2013). The rise of the VN-Index and HNX-Index meant that Vietnam has become one of the 10 countries with the world's most powerful recovery. Market capitalisation also increased to 31% of GDP in 2013 (approximately VND 964 trillion and increased by VND 199 trillion) compared to the end of 2012 (see Appendix B).

The development of the government bond market strengthened during 2010 and provided a number of important benefits for the domestic funding of the budget deficits other than that provided by SBV. First, at the macroeconomic level, it was able to reduce the need for direct and potentially damaging monetary financing of government deficits, as well as avoiding a build-up of foreign currency

----

11. The BIDV currently has around 37% of its loan portfolio exposed to the state-owned enterprises, (SOEs), 49% to the non-state owned enterprises and 14% to individuals. This rate is relatively high, compared to other commercial banks. SOEs account for roughly 40% of GDP (CIA, 2013).

debts. Second, at the microeconomic level, it was able to increase financial stability and improve financial intermediation through greater competition and development of related FMIs, in which a smooth and efficient settlement system plays an important role in reducing the level of risk in the financial system. These results are consistent with the findings of previous studies (IMF, 2001).

Table 3.3
Listing Scale in HOSE and HNX, 2013

HOSE								
Listing Scale	Stocks		Bonds		Others		Total	
	Shares	%	Shares	%	Shares	%	Shares	%
Listed Shares	301	88.27	38	11.14	2	0.59	341	100
Listed Volume[*]	27,117	99.58	70.09	0.26	45.41	0.17	27,232.5	100
Listed Value[**]VND	271,163	97.32	7,009	2.52	454	0.16	278,626	100
Listed Value[***]USD	12,891	97.32	333	2.52	22	0.16	13,245.2	100
HNX								
Listing Scale	Stocks		Bonds		Others		Total	
	Shares	%	Shares	%	Shares	%	Shares	%
Listed Shares	377	42.65	507	57.35	0	0	884	100
Listed Volume[*]	10,575	66.80	5,257	33.20	0	0	15,832	100
Listed Value[**]VND	82.082	13.50	525,754	86.50	0	0	607,836	100
Listed Value[***]USD	3,902	13.50	24,993	86.50	0	0	28,895	100
Payment System								
	Transactions							
	Volume		Value (Billion, VND)			Value (Million, USD)		
2013	35,809,116		40,920,248			1,945,249		

Note: (*): 1 million share; (**): billion in VND; (***): million in US$; 1 US$ = 21,036 VND (Interbank average exchange rate, date 14 Jan 2014).
Source: HNX (2014), HOSE (2014) and SBV (2014).

The stock market was expected to witness the retreat of foreign investments due to the impact of the financial crisis of 2007/2008, but in fact the foreign capital inflows increased 54% in 2013 and the portfolio value increased by US$3.8 billion compared to the end of 2012. The number of investor accounts reached about 1.27 billion. The account of foreign investors increased 55%. (SSC, 2013). Clearly, the financial market is important to economic development and strongly connected to the banking system. The finding points to the benefits of the FMIs in strengthening management, supervision, and handling of serious violations, and ensuring a strong and healthy economy.

Figure 3.3 indicates that the transaction volume of the PS increased over the years and reached approximately 36 million, with a value of nearly VND 41,000 trillion (US$2 trillion) in 2013 (see Table 3.3). The electronic clearing payment and settlement system (ECSS) has been reflecting a decrease roughly 50% in 2013 compared to recent years due to the remarkable development and

expansion of the interbank electronic payment system in terms of speed and scale, as well as the dramatic slowdown in economic growth following the financial crisis. The decrease in ECSS transaction volume and value showed the current tendency of payment system centralisation.

Figure 3.3
Transaction Values of Payment Systems, 2002-2013
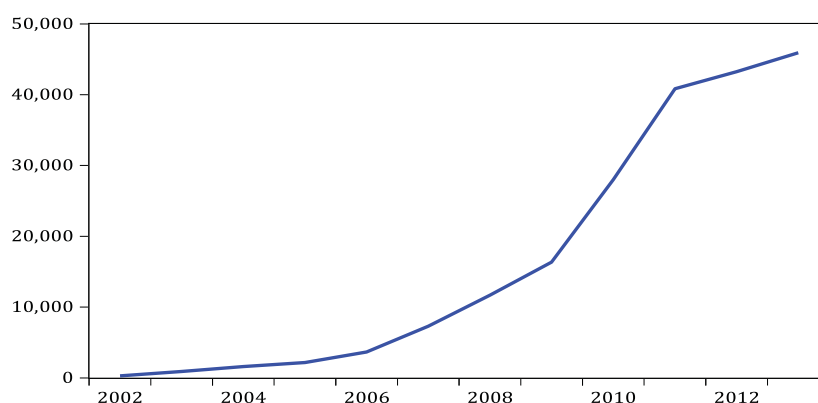
Clearly, the stability of the key FMIs has received much attention in light of the recent financial crisis and addresses the risks relating to systemic risk, legal risk, credit risk, liquidity risk, general business risk, custody and investment risks, as well as operational risk (BIS, 2010 and 2012; ADBI, 2013). It also outlines the responsibilities of central banks, market regulators and other relevant authorities to put in place recovery plans and resolution regimes for the FMIs in the event of disorderly failure (BIS, 2012). The Vietnamese regulatory responses to the global financial crisis help provide an illustration of how the local authorities have introduced frameworks and implemented the principles consistently to help manage and reduce systemic risks.

The payment system risks primarily include liquidity risk, credit risk, legal risk and operational risk. Therefore, the SBV operates as a counterparty and controls risks by providing the main functions of the payment system, such as account enquiries, balance warning, business queuing, clearing windows and automatic pledge financing (liquidity risk)[12]; setting of a net debit cap for

---

12. Participants must have a sufficient balance in their accounts in order to pay their net debit positions. If a participant has insufficient funds to cover the debit position within the due period, the SBV will provide overnight pledge financing and high penalty interest loans in the case of insufficient collaterals, as well as forcing participants to quit the local clearing system if they fail to make up the short position regularly.

335

participants (credit risk); formulating a series of rules and procedures on payment transaction processing (legal risk); setting of business limitations; strengthening network and data security; improving operation and maintenance; as well as establishing a sound disaster recovery mechanism in order to avoid systemic risks and ensure the payment system runs safely, steadily and reliably.

3.4 Financial Development

In this section, we investigate the financially related development indicators in Vietnam in order to shed light on the links between financial development indicators and financial market development indicators.

Over the past two years, the SBV has made considerable progress in achieving financial stability and restructuring the banking sector. As with many countries, there remain significant challenges in ensuring that the banking sector continues to support the economic development of Vietnam in years to come. The fiscal year 2013 saw the continued success of the SBV in monetary policy, foreign exchange reserves and gold management. Progress made in other aspects of the banking industry with some mergers and consolidation amongst commercial banks and the rollout of circulars (such as Circular No. 2), which allow for commercial banks to define provisions that are closer in line with international practice. Together with the establishment of the Asset Management Company (AMC) for NPLs, the expanded payment system is performing well, with no major system stoppages or service interruptions. All the implementing agencies have adopted the next five-year plan for IT infrastructure development, and continue to upgrade the systems with enhanced technical confidence and large funding of their own. The changes in organisational structure and business processes have made commercial banks more customer-centric in order to promote a non-cash economy and to further develop financial sector infrastructure, and improve access to finance.

Table 3.4
Financially Related Development Indicator Correlation

Indicators	PS/GDP	Financial Development Indicators			Stocks Market Development Indicators		
		LiqLiab	Commbank	BankCred	MktCap	ValTrade	Turnover
PS/GDP	1.0000						
LiqLiab[1]	0.2165	1.0000					
Commbank[2]	0.3238*	0.5062*	1.0000				
BankCred[3]	0.4784*	0.6456*	0.6073*	1.0000			
MktCap[4]	0.5921*	0.1216	0.1478*	0.2683*	1.0000		
ValTrade[5]	0.6376*	0.0685	0.1631	0.1833	0.6842*	1.0000	
Turnover[6]	0.3239	- 0.1526	0.1948	0.0457	0.6971*	0.7672*	1.0000

Note: * is statistically significant at a level of 5% or lower.

Table 3.4 shows the bivariate correlation between the financial related development indicators. The results overwhelmingly support the main hypothesis that financial development has a positive effect on financial market development. This may point to the fact that the improvements in the banking system, as well as macroeconomic development, appears to boost the financial performance of the listed firms and matters greatly to bond and stock market development. Consistent with the findings of Bhattacharya (IMF, 2013), the monetary policy transmission mechanism is weak, therefore it is hard to see the significant impact of interest rates on inflation and economic growth, but the recent success of the SBV has contributed to a positive relationship between the financial development indicators and the stock market development indicators. An important finding from our bivariate correlation analysis is that the VN-Index does not seem to have a significant impact on the payment system and banking sector in the short-term. First, customer sentiment was adversely affected by the global crisis, as

---

13. LiqLiab represents the sum total of currency plus demand and interest bearing liabilities of commercial banks and non-banks divided by GDP.

14. Commbank represents the total assets of commercial banks divided by the sum of commercial banks and central bank assets.

15. BankCred represents the ratio of total credit of commercial banks and other deposit-taking banks to the private sector by GDP.

16. MktCap represents the total value of stocks in the domestic market divided by GDP.

17. ValTrade represents the total value of stocks being traded by GDP.

18. Turnover represents the total value of stocks being traded divided by the total value of stocks listed in the domestic market (as opposed to stock price index).

previously mentioned. Second, investors have invested in bonds over the past few years. It can be concluded that the VN-Index has made a powerful recovery, although it does not reflect the strong connection between the stock market and banking sector developments.

However, the correlation coefficient typically ranges from -1 to +1 and quantifies the direction and magnitude of correlation (i.e. the degree to which two variables are related). It typically shows how much one variable tends to change when the other one does. It does not create a regression line. Therefore, the correlation analysis does not fit or plot a line through the data points while linear regression helps to find the best line that predicts the value of the dependent variable from the independent variable. On these occasions, we will carry out further investigation into the roles of the FMIs in reducing the damage from internal and external shocks to foster financial stability.

4. Empirical Analysis

An obvious extension of this study is to carry out an empirical investigation into the link between the FMIs (as opposed to the payment and capital market systems) (MAS, 2013), macroeconomic development and the management of the financial authorities (the Ministry of Finance and Central Bank). The findings are expected to contribute to the existing knowledge by providing possible explanations for the roles of the FMIs in avoiding certain systemic impacts and in reducing the damage from global and country-specific shocks in order to foster financial stability.

4.1 The Model and Results

Although the monetary policy of the SBV has been criticised by internal and external observers, empirical work to investigate how the monetary policy transmission mechanism operates in practice and affects domestic inflation, as well as the contributions of the FMIs to financial stability and economic growth, has been relatively limited to date. The empirical analysis in this section follows the inflation model developed by Goujon (2006), but modified by Nguyen, et al. (2013) and Bhattacharya (IMF, 2013). Rather than investigating the inflation determinants and dynamics in Vietnam, we examine the indirect contribution of the FMIs in financial stability and economic growth by adding indicators in the more conventional approach adopted by Bhattacharya (IMF, 2013). This results in the inflation model as a function of inflation (changes in consumer price index - ÄCPI) and of movements in the key economic variables, including the changes in GDP (changes in GDP growth - ÄGDP); in the money supply (changes in M2

growth - ÄM); in the nominal interest rate (changes in refinancing rate - ÄNIR); in the nominal effective exchange rate against the US dollar (ÄNEER), the payment system of GDP (PS); and stock market capitalisation (MktCap). In order to determine the impact of the global financial crisis on the economy, we add a dummy variable (Dgfc), which refers to the period after the global financial crisis of 2007/2008.

The study used quarterly data for the period from 2002Q1 through to 2013Q4. All the variables are measured in terms of percentage changes over the previous period, except for the refinancing rate, for which the end-of-period interest rate is used. Different methods are utilised in the study to find answers to the research questions concerning how the FMIs affect financial stability. In order to examine whether a time series variable is stationary or non-stationary, we use Augmented Dickey-Fuller Unit Root tests. The results show that all variables are stationary and are consistent with the results of Bhattacharya (IMF, 2013). We also carry out the Quandt-Andrews tests for structural breaks. The results are consistent with Bhattacharya (IMF, 2013) and suggest that there are structural breaks in 2004Q1 and in 2007Q4.

To accomplish the above objectives, we perform the regression model derived from the previous study as follows:

$$\Delta\text{CPI}_t = \alpha + \beta_1\Delta\text{CPI}_{t-1} + \beta_2\Delta\text{GDP}_{t-1} + \beta_3\Delta\text{M}_{t-1} + \beta_4\Delta\text{NIR}_t + \beta_5\Delta\text{NEER}_{t-1} + +\beta_6\Delta\text{PS}_{t-1} + \beta_7\text{MktCap}_{t-1} + \beta_8\text{D}_{gfc} + \varepsilon_{itc}$$

The coefficients of the money supply, exchange rate and the refinancing rate, as well as the changes in GDP, capture the effects of the monetary policy of the SBV on inflation, while the coefficients on the payment system and stock market capitalisation capture the indirect link between FMIs and inflation through financial stability and economic growth. Bhattacharya (IMF, 2013) provides a critical literature review of the economic theory and quantitative evidence of the inflation determinants, in particular addressing the importance of effective financial management in controlling domestic inflation. The theoretical signs suggest that money supply growth and exchange rate depreciation would have a positive effect on domestic inflation, while increases in the refinancing rate and higher total payment value settled in the payment system to GDP, stock market capitalisation and GDP growth[19] would have a negative effect on domestic inflation. Consistent

---

19. The higher GDP growth reflects the higher productive capacity and not excess demand.

with Bhattacharya (IMF, 2013), we measured in terms of percentage changes of the variables from the previous year, except for the refinancing rate, where the end of period nominal rate is used.

This study found that there is a negative relationship between inflation and both banking and securities market activities. As inflation rises, the marginal impact of inflation on banking and stock market development diminishes rapidly. Further, we find evidence of thresholds, and if the inflation rate continues to rise beyond the threshold, the relationship between inflation and financial sector performance reverses (i.e., both the banking system and stock market drop significantly)[20]. Moreover, high inflation, caused by an excessive growth of the money supply, will make the population lose confidence in the local currency and have a harmful effect on economic growth (including further intensification of debt crises). The central bank therefore makes efforts to control and maintain low inflation for its economic benefits through contractionary monetary and fiscal policies. Given the critical role of the FMIs[21], it is not surprising that they have become key elements in the central bank's efforts to strengthen financial stability in order to encourage economic development.

---

20. In order to meet the requirement of brevity, this paper summarised some of the key results from our research. In other words, for the resulting threshold and additional quantitative results, please do not hesitate to contact us on any relevant subject and inquiries you may have.

21. Virtually all financial transactions are cleared, settled and recorded via the FMIs which allow consumers and enterprises to safely and efficiently make payments, make financial investments, and transfer funds.

Table 4.1
Impact of FMIs on Domestic Inflation

Variables	ln∆CPI
ln∆CPI$_{t-1}$	0.5487*** (0.0214)
ln∆GDP$_{t-1}$	0.0566 (0.0151)
ln∆M$_{t-1}$	0.0863* (0.0337)
ln∆NIR$_t$	-0.0957** (0.0591)
ln∆NEER$_{t-1}$	0.0832** (0.0618)
lnPS$_{t-1}$	-0.0602 (0.0961)
lnMktCap$_{t-1}$	-0.0835* (0.0133)
Dgfc	0.0896** (0.0756)
AR (1)[a]	-1.86***
AR (2)[b]	-0.84
Wald Test	142.65***
Sargan Test[c]	48.52 P-value = 0.657

Note: ***, **, and * are statistically significant at the levels of 1%, 5% and 10%, respectively.

The value of the standard error is in parentheses.

[a] Arellano-Bond test for AR (1) in first differences.

[b] Arellano-Bond test for AR (2) in first differences.

[c] Sargan test for over identifying restrictions in GMM dynamic estimation.

4.2 Impact of Global and Country-specific Shocks on the Economy and Financial Market

Figure 4.1
Inflation in Emerging Asian Economies, 2002-2012

Source: IMF (2013).

341
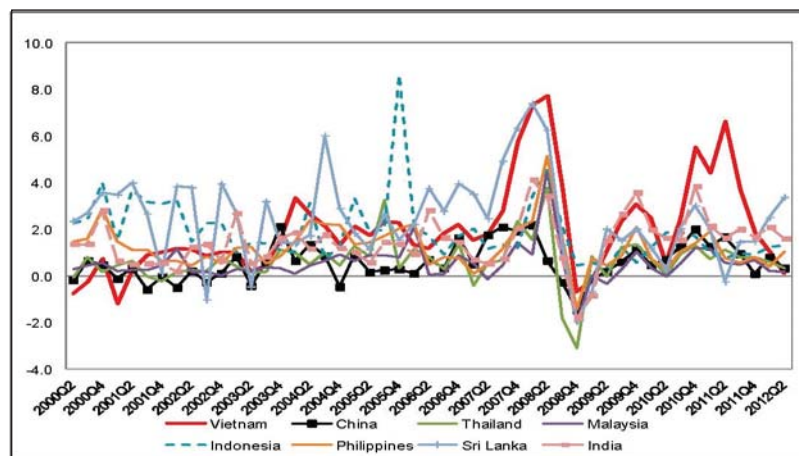
Table 4.1 shows that the global financial crisis is positively related to domestic inflation. This leads to the conclusion that high inflation affects an economy in many different ways, such as distortion of consumer behaviour, income redistribution and a larger trade deficit. It tends to undermine business confidence, since it becomes difficult to predict the future costs and returns from investments. Despite its deceleration, Vietnam has suffered from higher and more volatile inflation compared to most emerging Asian economies since mid-2007 (Figure 4.1). This is considered to be a reflection of weaknesses in the macroeconomic policy framework. In particular, monetary policy in Vietnam has been criticised for lack of transparency and predictability, and for following multiple objectives and at times conflicting objectives. In practice, four key objectives have been guiding monetary policy; namely, promoting economic growth, fighting inflation, stabilising the exchange rate, and preserving the stability of the financial system. There is also prevalent use of caps on interest rates and controls on credit. It can be concluded that the central bank is passive rather than forward-looking in responding to inflation, and that the monetary policy transmission mechanism is weak; therefore, the interest rate has become an ineffective tool for combating inflation. Recently, the inflation problems of the past have been addressed and are currently at a level that promotes stability. The liquidity of the banking system has improved significantly, the currency has been effectively stabilised, and the lending interest rates continue to decline. Macroeconomic stability has largely been a result of the policies and actions of the SBV, which provides a foundation to support sustainable economic growth in the coming years.

The sharp reaction of the world economy following the global financial crisis supports the hypothesis that the globalisation process had also been heated up by a trade bubble, such that excessive expectations for global production and trade coincided with the bubble in the financial markets. The global financial crisis has affected Vietnam's financial market in the following ways: (i) indices dived sharply in both trading platforms; (ii) foreign investors have tended to realign their investment strategies and restructure portfolios; (iii) there has been possible capital withdrawal from the financial market to other investment channels; and (iv) the external shock has exposed serious structural weaknesses in the economy. However, Vietnam has so far not been affected, for two main reasons. First, Vietnam's financial market has a lower degree of international integration. Second, the government possesses at least 51% of major commercial banks' equity. Nonetheless, economic growth and employment have been affected indirectly through international trade, FDI and financial capital movement. Exports have suffered the strongest negative impact due to the economic problems in the US, EU and Japan, which together account for more than 60% of Vietnamese exports.

Risk management has always been a part of banking management, although it may have been conducted under different names and for different reasons. It appears that some banks have experienced problems as a result of expansive operations and have neglected prudential principles. A growing banking industry will become more vulnerable if it is unable to evaluate the risk of increased lending and diversification of products. Bankers have not had the experience of market-based banking activities. The current problem of NPLs has been described as a matter of bad risk management. Commercial banks make loans mainly on their evaluation of the collateral pledged, rather than on a forecast of the borrower's ability to repay them.

Financial sector reform is recognised as a key to achieving high growth, low inflation, reducing poverty and transforming Vietnam's economy into a market-based one. The explosive growth of the stock market (Appendix B) has highlighted the urgent need to upgrade the FMI and to strengthen financial sector supervision in order to overcome the market failures and imperfections by reducing transaction costs and information asymmetries. The interdependence of the FMIs may lead to systemic risks; therefore, both financial regulatory and supervisory authorities need to strengthen the economic infrastructure by adopting global requirements for the FMIs (i.e., by developing and implementing risk management standards and by shaping the frameworks in which financial relationships and interactions take place).

5. Conclusion and Recommendations

Clearly, FMIs play a key role in the smooth functioning of the economy and can enhance the stability of markets, as well as promoting wider financial stability. Market functioning can be dependent on the continuity and orderly operation of the services that these infrastructures provide. Oversight and supervision of the FMIs are opposed to monitoring, managing and mitigating risks (including systemic risk), which becomes a primary responsibility for the operators. They are closely linked to preserving financial stability. Therefore, the central bank tends to undertake its supervision of the FMIs with a view of protecting and enhancing the stability of the financial system based on the design, rules, procedures and the operation of the FMIs.

The MOF and SBV jointly regulate the financial markets. The SBV is the chief regulatory body for all issues affecting the banking industry, while the MOF is considered as a government agency and is responsible for the regulation of commercial banks and non-bank institutions and participates in the management of the bond and stock markets. In order to connect the securities clearing and

settlement system with the payment system, the SBV will assume the prime responsibility for this and coordinate with the MOF to ensure the delivery versus payment mechanism.

It will do this for the following reasons:

First, the MOF must perfect the securities clearing settlement system in the long term by connecting it to the payment system to ensure delivery versus payment, and to reduce the risks in the settlement of transactions on the stock market when these transactions develop more widely. This will help to avoid solvency risks when the increasing volume of transactions exceeds the processing capacity of the settlement bank (BIDV). This tends to cause systemic risk and inequality between members participating in the stock markets.

Second, the SBV must ensure the flexibility, proactiveness and effectiveness of the operations of the open market and refinancing transactions, as well as increase the effectiveness of the administration of the monetary policies on the basis of promoting the availability and speed of circulation of high-value paper assets pledged for refinancing activities.

Third, the SBV and MOF need to adopt the 24 principles issued by the Committee on Payment and Settlement Systems (CPSS) and the International Organisation of Securities Commissions (IOSCO) (BIS, 2012) as the principles of commercial banks (for the payment system) and securities market (for the securities clearing and settlement system). The new standards are designed to promote financial stability and to ensure that the FMIs supporting the financial market are more robust and well placed to withstand both external and internal shocks. Although differences in implementation by countries and regions have emerged, they do not lead to regulatory arbitrage or weakened standards, as long as the government does not isolate itself from the world, but instead engages with other countries. All the FMIs will need to make improvements to their risk-management practices in order to meet the new standards. Therefore, each designed FMI is undertaking a rigorous analysis of its practices against the new principles, identifying gaps and developing plans to address them.

Fourth, the government needs to redouble its efforts to strengthen the economic infrastructures (including the physical infrastructure, legal institutions and the financial systems). Further, managing credit and liquidity risks requires effective governance, with particular regard to a commitment to transparency. Clearing members bear primary responsibility for understanding the risks associated

with participating in a CCP, including their potential exposures in the event of a default. This may point to the fact that CCPs need to provide clear and transparent information to facilitate the analysis of the members (clearing members and their clients, regulators, and the broader public) in order to assess the adequacy of the risk management.

References

Asian Development Bank, (2012), "Vietnam Bond Market Guide," in *ASEAN+3 Bond Market Guide,* Volume 1, Part 2, Available at: https://wpqr1.adb.org/ LotusQuickr/asean3abmf/Main.nsf/h_Index/ 4CC53EFBD63D7BA3482579D4001B5CED/$file/ ABMF%20Vol1%20Sec%2011%20VIE.pdf (Accessed: 15 July 2013).

Asian Development Bank, (2013), "Vietnam Bond Market," in *Asian Bond Online: An Asian + 3 Initiative,* Available at: http:// asianbondsonline.adb.org/vietnam.php (Accessed: 1 Jan 2014).

Asian Development Bank, (2014), Key Indicators for Asia and the Pacific, Available at: http://www.adb.org/ki2013/StatTrends.html, (Accessed: 15 Jan. 2014).

Bank of Canada, (2013), Toward a Stronger Financial Market Infrastructure for Canada: Taking Stock, Available at: www.bankofcanada.ca/wp-content/ uploads/2013/03/remarks-260313.pdf, (Accessed: 15 August 2013).

Bank of England, (2013), The Bank of England's Approach to the Supervision of Financial Market Infrastructures, Available at: www.bankofengland.co.uk/ publications/Documents/news/2012/nr161.pdf (Accessed: 15 April 2013).

Bank for International Settlements, (2010), Market Structure Development in the Clearing Industry: Implications for Financial Stability, Basel, Switzerland: Committee on Payment and Settlement Systems, B1IS, September.

Bank for International Settlements, (2012), Principles for Financial Markets Infrastructure, BIS and OICV-OISCO, April.

Bao Viet Securities Company, (2012), "Vietnam Bond Market in the First 6 Months of 2012," Available at: http://vninvestment.files.wordpress.com/2012/04/ bond2aug12.pdf, (Accessed: 15 July 2013).

Bhattacharya, Rina, (2013), "Inflation Dynamics and Monetary Policy Transmission in Vietnam and Emerging Asia," *IMF Working Paper*, WP/ 13/155, Available at: http://www.imf.org/external/pubs/ft/wp/2013/ wp13155.pdf, (Accessed: 15 September 2013).

Central Intelligence Agency, (2013), The World Factbook – Vietnam Economy, Available at: www.cia.gov/library/publications/the-world-factbook/geos/vm.html, (Accessed: 15 April 2013).

Citibank, (2013), Vietnam Market Update, Citibank Securities and Fund Services, Online Academy, 16 September, Available at: www.citibank.com/transactionservices/home/about_us/online_academy/docs/vietnam_market.pdf, (Accessed: 1 Jan 2014).

Goujon, M., (2006), "Fighting Inflation in a Dollarized Economy: The Case of Vietnam," *Journal of Comparative Economics,* Vol. 34, pp. 564-581.

HNX, (2014), HNX Events: PVB Stock of Petrol Vietnam Coating Joint Stock Company Traded (24/12/2013), Hanoi Stock Exchange (Online), Available at: www.hnx.vn/web/guest/107, (Accessed: 15 Jan 2014),

HOSE, (2014), Current Listing Scale of Securities, Hochiminh Stock Exchange (Online), Available at: www.hsx.vn/hsx_en/Modules/Statistic/QMNY.aspx, (Access: 15 Jan 2014).

International Monetary Fund, (2001), "Developing Government Bond Market: A Handbook," World Bank Publications, Available at: www1.worldbank.org/finance/assets/images/Handbook_14955_chapter_1.pdf.

Khiaonarong, Tanai, (2013), "Creating an Association of Southeast Asian Nations Payment System: Policy and Regulatory Issues," *ADBI Working Paper Series,* No. 422, May, Tokyo: Asian Development Bank Institute, Available at: www.adbi.org/files/2013.05.20.wp422.asean.payment.system.policy.regulatory.issues.pdf, (Accessed: 10 Jan 2014).

Le, D., (2008), "The Development of E-payments and Challenges in Vietnam," Published in *The Development of E-Payments and Challenges for Central Banks in the SEACEN Countries*, Kuala Lumpur: Southeast Asian Central Banks Research and Training Centre (SEACEN). Available at: http://www.seacen.org/GUI/pdf/publications/research_proj/2008/rp71/Chap11.pdf, (Accessed: 15 Jan 2014).

Ministry of Finance of Japan, (2009), "Vietnam Payment System," Ministry of Finance of Japan, Available at: www.mof.go.jp/english/international_policy/others/sseae2004/SSEAE2004-8.pdf, (Accessed: 15 April 2013).

Ministry of Finance of Vietnam, (2013), "State Securities Commission: Determined to Implement Restructuring the Stock Market," Ministry of Finance (Online), Available at: http://www.mof.gov.vn/portal/page/portal/mof_vn/ttsk/3312584?pers_id=2177092&item_id=116925247&p_details=1, (Accessed: 10 Jan 2014).

Monetary Authority of Singapore, (2013), "Supervision of Financial Market Infrastructures in Singapore," Available at: www.mas.gov.sg/~/media/MAS/About%20MAS/Monographs%20and%20information%20papers/MASMonograph_Supervision_of_Financial_Market_Infrastructures_in_Singapore%20Final.pdf, (Accessed: 15 April 2013).

Nguyen, H. M.; T. Cavoli and J. K. Wilson, (2012), "The Determinants of Inflation in Vietnam, 2001-2009," *ASEAN Economic Bulletin*, Vol. 29 (1), April, pp. 1-14.

Nguyen, Q. H., (2012), "Vietnam's Capital Markets: Young and Growing," Institute of Developing Economies (IDE) of Japan External Trade Organisation (Online), Available at: www.ide.go.jp/Japanese/Publish/Download/Report/2011/pdf/107_ch9.pdf, (Accessed: 15 April 2013).

State Bank of Vietnam, (2012), Annual Report, 2011, Available at: www.sbv.gov.vn/portal/faces/vi/vifm/vifpages_bctn?_adf.ctrl-state=pbzfa8bs5_4&path=%2Foracle%2Fwebcenter%2Fportalapp%2Fpagehierarchy%2Fpages%2Fvi%2FvifootermenuPages.xml&_afrLoop=4324456859184800, (Accessed: 10 Jan 2014).

State Bank of Vietnam, (2014), Transaction Data of National Payment System - Payment Statistics, Available at: www.sbv.gov.vn/portal/faces/en/enm/enpages_home/statistic/paymentstatistic/paymentsys?_adf.ctrl-state=112kcodp0s_4&_afrLoop=4509736031028900, (Accessed: 10 Jan 2014).

State Securities Commission, (2013), SSC Appreciated for Job Done in 2013 and Urged to Continue Proactive Contributions to Financial Work in 2014: Minister of Finance, Available at: www.ssc.gov.vn/ubck/faces/oracle/webcenter/portalapp/pages/en/newsdetail.jspx?dDocName=APPSSCGOVVN162085825&_afrLoop=197821384424000&_afrWindowMode=0&#%40%3F_afrLoop%3D197821384424000%26dDocName%3DAPPSSCGOVVN162085825%

26_afrWindowMode%3D0%26_adf.ctrl-state%3D1s1lzywes_140 (Accessed: 10 Jan 2014).

State Securities Commission (2014), HNX 2013: Developing Depth and Preparing the Foundation for a New Phase, (Online News), Available at: www.ssc.gov.vn/ubck/faces/vi/vilinks/videtail/vichitietthongtinthitruong/ vidsthongtintrenhnx/vidstintuchnx/vichitiet119?dDocName= APPSSCGOVVN162085851&_afrLoop=62800229107000, (Accessed: 15 Jan 2014).

Trading Economics, (2014), Vietnam Stock Market (VN-Index), Available at: http://www.tradingeconomics.com/vietnam/stock-market, (Accessed: 1 Jan 2014).

United Nations Conference on Trade and Development, (2013), Least Development Countries Report, 2012, Available at: http://unctad.org/en/ PublicationsLibrary/ldc2012_en.pdf, (Accessed: 10 August 2013).

Vietnam Investment Reviews, (2013), "Bond Market is Set to Remain a Safe Haven," *Vietnam Investment Reviews Onlin*e, Available at: http:// www.vir.com.vn/news/en/money/bond-market-is-set-to—remain-a-safe-haven.html, (Accessed: 15 August 2013).

VnEconomy, (2013), "Stock Market Capitalisation of Vietnam in 2013," *VnEconomy (Online),* Available at: http://vneconomy.vn/ 20131211084752332P0C7/quy-mo-thi-truong-chung-khoan-nam-2013-dat-31-gdp.htm, (Accessed: 10 Jan 2014).

World Bank, (2014), The Date by Country: Vietnam, Available at: http:// data.worldbank.org/country/vietnam, (Accessed: 15 Jan 2014).

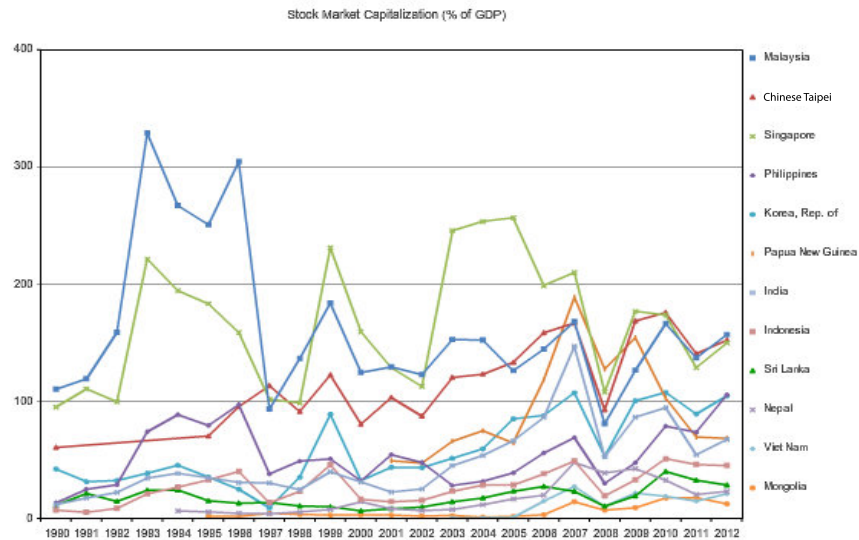**Delivery versus Payment of Trading Securities**
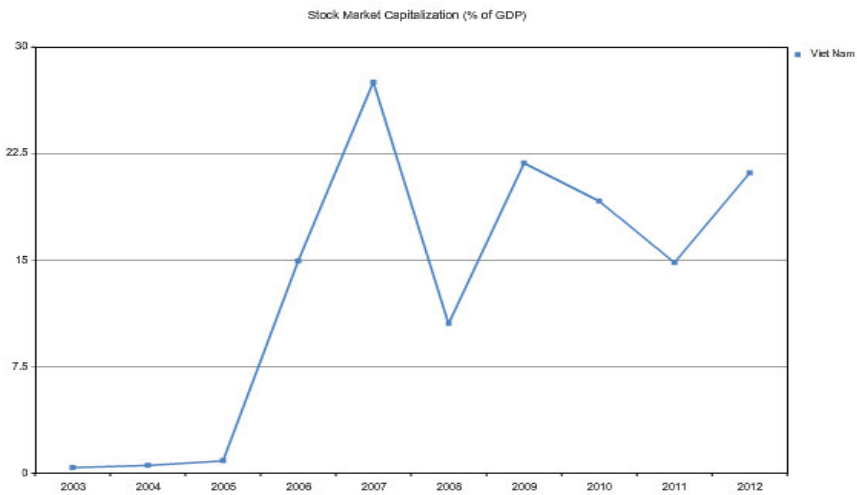

Source: ADB (2012).

350
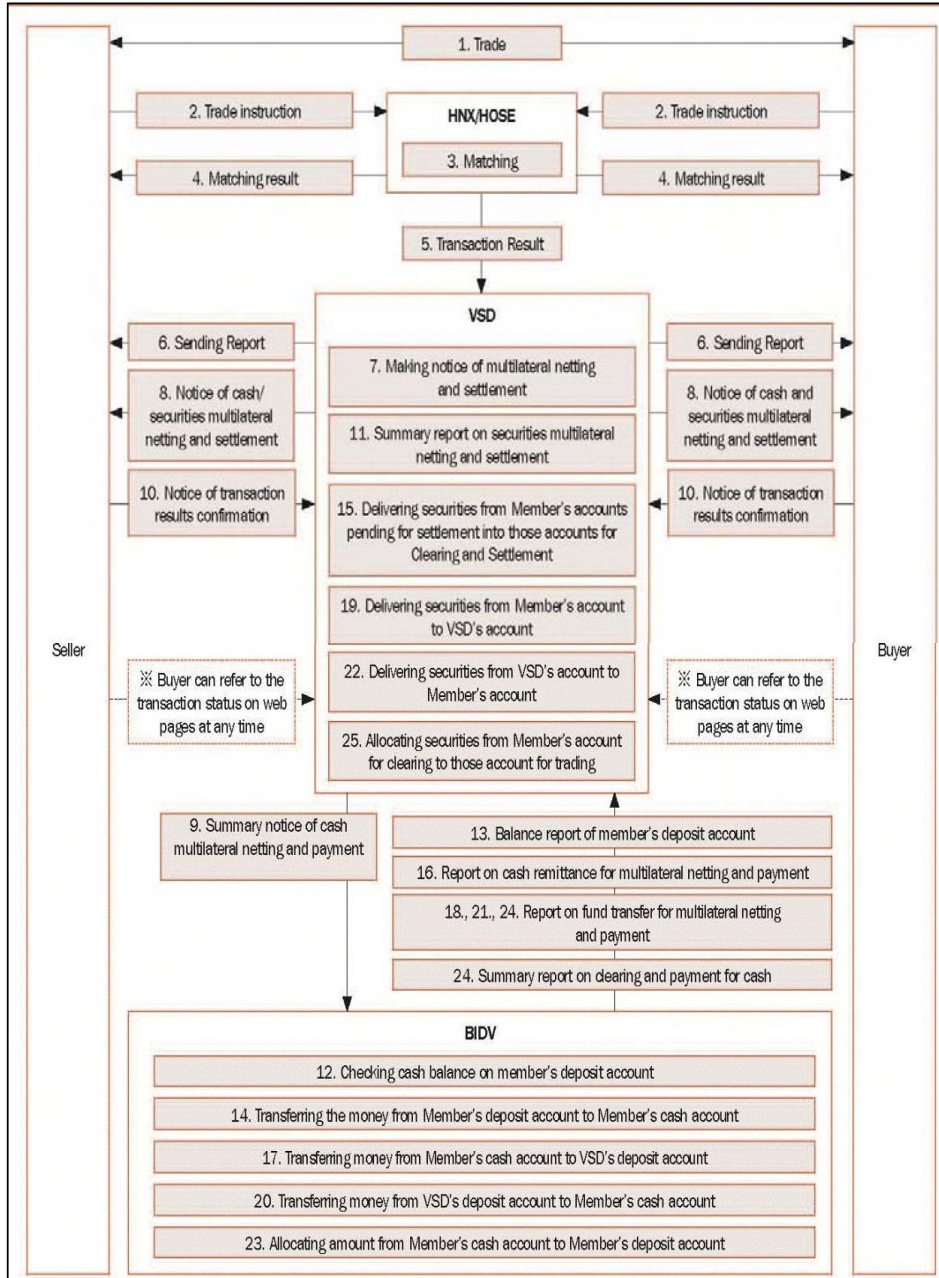
Stock Market Capitalisation (% of GDP)

Panel 1: Stock Market Capitalisation of the SEACEN Economies

Source: ADB (2014).

Panel 2: Stock Market Capitalisation of Vietnam

Source: ADB (2014).

351