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 Edwin Prabu is an Assistant Adviser at the Department of Economic & Policy Research, Reserve Bank of India, and wishes to thank R.K. Jain, Nilima C. Ramteke and Kalpana Patel of RBI for providing helpful suggestions on the payment and settlement system in India. The views expressed in this paper are solely that of the author and do not necessarily represent the position of the Reserve Bank of India or The SEACEN Centre.
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 Mannar².

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 area³. 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).

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)

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>GDP Growth</td>
<td>8.7</td>
<td>6.7</td>
<td>8.6</td>
<td>8.9</td>
<td>6.7</td>
<td>4.5</td>
<td>7.1</td>
</tr>
<tr>
<td>WPI Inflation</td>
<td>5.5</td>
<td>8.1</td>
<td>3.8</td>
<td>9.6</td>
<td>8.9</td>
<td>7.4</td>
<td>7.6</td>
</tr>
<tr>
<td>Repo Rate (Policy Rate)</td>
<td>6.7</td>
<td>7.4</td>
<td>4.8</td>
<td>5.9</td>
<td>8.1</td>
<td>7.9</td>
<td>6.7</td>
</tr>
<tr>
<td>Exchange Rate (Rs per USD)</td>
<td>44.13</td>
<td>45.92</td>
<td>47.42</td>
<td>45.58</td>
<td>47.92</td>
<td>54.41</td>
<td>48.21</td>
</tr>
</tbody>
</table>

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 collaterised 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 countereacting 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).
2.1 General Policy and Regulation Framework of FMIs in India

2.1.1 Payment and Settlement System

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

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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

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. 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

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](image)


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. 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. The RBI recognised the CCIL as the critical FMI for India in July 2013.

2.2.3.2 Clearing Houses in the Equity and Derivative Markets

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\(^9\). Further, the RBI has stated that the CCIL as a trade depository would be regulated using the principles of FMIs (PFMs).

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.

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

### 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).

### Table 2

<table>
<thead>
<tr>
<th>SN</th>
<th>Markets</th>
<th>Clearing</th>
<th>Settlement</th>
<th>Funds</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Money Market</td>
<td>CBLO</td>
<td>CCIL</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Bond Market (Government Securities)</td>
<td>Primary Markets</td>
<td>Bids flow directly to the RBI PDO, RBI</td>
<td>RTGS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CCIL</td>
<td>PDO, RBI</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>RTGS</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Forex Market</td>
<td>USD-INR</td>
<td>CCIL</td>
<td>USD settlement through CCIL’s correspondent bank in New York</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>RTGS</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Securities Market</td>
<td>Equities</td>
<td>NSCCL/BOISCL Settlement Banks</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Corporate Bonds</td>
<td>NSCCL/ICCL</td>
<td></td>
</tr>
</tbody>
</table>

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.
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, 

<table>
<thead>
<tr>
<th>SN</th>
<th>FMI Type</th>
<th>Ownership</th>
<th>FMI (name)</th>
<th>Authorisation, Designation, or Licensing</th>
<th>Oversight</th>
<th>Supervision</th>
<th>On-site Inspection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Payment System</td>
<td>Public</td>
<td>RTGS</td>
<td>-</td>
<td>RBI</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>CSD/SSS</td>
<td>Public</td>
<td>PDO, RBI &amp; NDS-OM</td>
<td>-</td>
<td>RBI</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2.1</td>
<td>Government Securities</td>
<td>Public</td>
<td>PDO, RBI &amp; NDS-OM</td>
<td>-</td>
<td>RBI</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2.2</td>
<td>Equity and Debt Instruments</td>
<td>Private</td>
<td>NSDL and CDSL</td>
<td>SEBI</td>
<td>SEBI</td>
<td>SEBI</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>CCP</td>
<td>Private</td>
<td>CCIL</td>
<td>RBI</td>
<td>RBI</td>
<td>RBI</td>
<td>RBI</td>
</tr>
<tr>
<td>3.1</td>
<td>Money (CBLO), Govt and Forex Market</td>
<td>Private</td>
<td>CCIL</td>
<td>RBI</td>
<td>RBI</td>
<td>RBI</td>
<td>RBI</td>
</tr>
<tr>
<td>3.2</td>
<td>Stock, Corporate bond Market and Exchange Traded Derivatives</td>
<td>(i) NSE</td>
<td>Private</td>
<td>NSCCL</td>
<td>SEBI</td>
<td>SEBI</td>
<td>SEBI</td>
</tr>
<tr>
<td>4</td>
<td>Trade Depositories</td>
<td>Private</td>
<td>CCIL</td>
<td>RBI</td>
<td>RBI</td>
<td>RBI</td>
<td>RBI</td>
</tr>
</tbody>
</table>

Source: Various Publications of RBI and SEBI.
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.
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

<table>
<thead>
<tr>
<th>Table 4</th>
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<tbody>
<tr>
<td>Number of Participants in the FMIs in India</td>
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<tr>
<td>(End of Year)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>RTGS</strong></td>
</tr>
<tr>
<td>Number of participants</td>
</tr>
<tr>
<td>Direct participants</td>
</tr>
<tr>
<td>Banks</td>
</tr>
<tr>
<td>Reserve Bank of India</td>
</tr>
<tr>
<td>Other direct participants*</td>
</tr>
<tr>
<td><strong>Government Securities Market</strong></td>
</tr>
<tr>
<td>Total number of participants</td>
</tr>
<tr>
<td>Reserve Bank of India</td>
</tr>
<tr>
<td>Central counterparties (CCPs)</td>
</tr>
<tr>
<td>Banks</td>
</tr>
<tr>
<td>Others</td>
</tr>
<tr>
<td><strong>Capital Markets</strong></td>
</tr>
<tr>
<td><strong>NSE</strong></td>
</tr>
<tr>
<td>Total number of participants</td>
</tr>
<tr>
<td>Reserve Bank of India</td>
</tr>
<tr>
<td>Central counterparties (CCPs)</td>
</tr>
<tr>
<td>Banks</td>
</tr>
<tr>
<td>Others</td>
</tr>
<tr>
<td><strong>BSE</strong></td>
</tr>
<tr>
<td>Total number of participants</td>
</tr>
<tr>
<td>Reserve Bank of India</td>
</tr>
<tr>
<td>Central counterparties (CCPs)</td>
</tr>
<tr>
<td>Banks</td>
</tr>
<tr>
<td>Others</td>
</tr>
</tbody>
</table>

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).

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).
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.
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)

<table>
<thead>
<tr>
<th>Settlement Period</th>
<th>Gross (US$ Billion)</th>
<th>Net (US$ Billion)</th>
<th>Netting Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006-07</td>
<td>1777.0</td>
<td>171.8</td>
<td>90.33</td>
</tr>
<tr>
<td>2007-08</td>
<td>3133.7</td>
<td>239.2</td>
<td>92.37</td>
</tr>
<tr>
<td>2008-09</td>
<td>3758.9</td>
<td>209.8</td>
<td>94.42</td>
</tr>
<tr>
<td>2009-10</td>
<td>2989.0</td>
<td>177.1</td>
<td>94.07</td>
</tr>
<tr>
<td>2010-11</td>
<td>4191.0</td>
<td>212.3</td>
<td>94.94</td>
</tr>
<tr>
<td>2011-12</td>
<td>4642.6</td>
<td>214.7</td>
<td>95.37</td>
</tr>
<tr>
<td>2012-13</td>
<td>4830.9</td>
<td>222.5</td>
<td>95.30</td>
</tr>
</tbody>
</table>

Source: Rakshithra, CCIL, November 2013.

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)](chart7)


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 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. 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.
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.
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 |

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).
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.
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.
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

![Chart 13](source)

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

<table>
<thead>
<tr>
<th>No. of members</th>
<th>No. of Direct members</th>
<th>No. of Associate Members</th>
</tr>
</thead>
<tbody>
<tr>
<td>G-Sec</td>
<td>163</td>
<td>131</td>
</tr>
<tr>
<td></td>
<td></td>
<td>21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>CBLO</td>
<td>200</td>
<td>112</td>
</tr>
<tr>
<td></td>
<td></td>
<td>61</td>
</tr>
<tr>
<td></td>
<td></td>
<td>17</td>
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<tr>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>


### 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)

<table>
<thead>
<tr>
<th>RTGS and Financial Development Indicators</th>
<th>RTGS</th>
<th>Liqlab</th>
<th>CommBank</th>
<th>Bankcred</th>
</tr>
</thead>
<tbody>
<tr>
<td>RTGS</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liqlab</td>
<td>0.87</td>
<td>(0.00)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CommBank</td>
<td>0.99</td>
<td>(0.00)</td>
<td>0.89</td>
<td>(0.00)</td>
</tr>
<tr>
<td>Bankcred</td>
<td>0.99</td>
<td>(0.00)</td>
<td>0.87</td>
<td>(0.00)</td>
</tr>
</tbody>
</table>

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 PFMI. 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 PFMI 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 years as well as the 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 PFMs 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\textsuperscript{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.

\textsuperscript{12} http://www.rbi.org.in/Scripts/BS_PressReleaseDisplay.aspx?prid=30317
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Appendix

Table 1

Stylised Statistics of India

<table>
<thead>
<tr>
<th>SN</th>
<th>Economy ($ mill.)</th>
<th>Pop (mil.)</th>
<th>Area (sq. km)</th>
<th>GT</th>
<th>KA</th>
<th>EI</th>
<th>FD</th>
<th>PST</th>
<th>PS (RTGS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1210</td>
<td>3287240</td>
<td>C</td>
<td>B</td>
<td>44%</td>
<td>52.3%</td>
<td></td>
<td>1330%</td>
<td>1020%</td>
</tr>
</tbody>
</table>