Clearing Corporation of India Ltd.

R.H. Patil Memorial Lecture

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FINANCIAL MARKET INFRASTRUCTURE IN INDIA:

Status and Way Forward

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Deputy Governor B.P. Kanungo, Chairperson Mrs. Usha Thorat, Managing Director, Mr. R. Sridharan, the late Dr. R.H. Patil's family and friends,

I am very happy to be here amidst friends. Mr. Kanungo and I worked together in the Reserve Bank of India (RBI). I had worked with Sridharan when I was in Ministry of Finance in the 1990s. I used to depend heavily on bankers who were on deputation in the Ministry of Finance, in particular, Sridharan and Mr. R. Krishnamurthi, both of whom were on deputation from the State Bank of India. I had brief interactions with both Shyamala Gopinath and Usha when I was in the Ministry of Finance and later we were colleagues in the RBI for more than a decade. In some ways, this is a silver jubilee year of my association with such life-long friends.

However, our combined knowledge related to the government, RBI and banks. For the development of the financial sector, we needed to understand financial markets and the way they functioned. Globally, at that time, the financial sector was developing rapidly and India was just starting the process of building financial markets. It was our good fortune that we had Dr. R.H. Patil to guide us.

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The Clearing Corporation of India Ltd (CCIL) was just one of his many contributions to India's financial sector. However, it is unique since it is in the nature of an innovation and was his brainchild. It is, therefore, appropriate that CCIL has decided to institute a memorial lecture in memory of its founder as it completes fifteen years.

I first met Dr. Patil in Hyderabad when he was in the Industrial Development Bank of India (IDBI) and I was Managing Director of the Andhra Pradesh Industrial Development Corporation (APIDC). As a state-level corporation, APIDC was under the purview of IDBI. Dr. Patil visited us and we had a series of discussions. I was pleasantly surprised to see that he was very knowledgeable, very wise, but very polite, pleasant and dignified. We became friends almost instantly.

When I was joint secretary in charge of capital markets in the Ministry of Finance in 1992-93, I went to meet him in his office in IDBI. Finance Minister Dr. Manmohan Singh was keen to set up the National Stock Exchange (NSE) and Mr. S. S. Nadkarni, Chairman, IDBI told me that Dr. Patil was entrusted with the task. We worked out the details for getting all the necessary clearances and this was made easier because of the trust we had in each other.

When I moved to the Ministry of Commerce and the NSE was being set up, Dr. Patil came to meet me though I had nothing to do with the subject. He wanted advice about whether he should accept the offer made by the Ministry of Finance to install computers and other facilities with the help of supplier's credit with some concessionality. I advised him to select the best technology and the best machines in the world and buy them. I told him that this would be quicker than taking suppliers' credit. He recalled this incident years later in a public meeting in Mumbai. That was another characteristic of Dr. Patil, namely, recognising and managing goodness among people.

When I became Deputy Governor in the RBI, he became a major source of knowledge and wisdom and great support. It is during this period that we worked together to establish CCIL. I must confess that I was an honest broker between RBI Governor Bimal Jalan, Dr. Patil and the likes of Usha and Shyamala, who did the real work. When I became Governor, he became my trusted friend, philosopher and guide.

I am not sure how many of you know that Dr. Patil started his career in 1968 at the then Economic Department of the RBI. In 1975, he joined IDBI, which he left in 1993 to set up the NSE as its first Managing Director. I am sure all of you know the kind of transformation that NSE brought about in the Indian capital markets. After retiring from NSE in 2001, he joined CCIL in May 2001 as the company's founder Chairman. CCIL is singularly fortunate to have

had a visionary and leader like Dr. Patil being entrusted with the task of setting it up. He was ably assisted by Mr. M.R. Ramesh, the first Managing Director, and a group of dedicated professionals as the initial team. By the time he left in early 2011, CCIL had come to be regarded as one of the success stories in the Indian financial markets.

Dr. Patil spearheaded the setting up of such infrastructure not only in the equities market, but also in the government securities, money and forex markets. He led several major financial market reforms, and, apart from CCIL and NSE, he created other internationally acclaimed institutions like the National Securities Clearing Corporation Limited (NSCCL) and the National Securities Depository Limited (NSDL) which today stand as pillars of strength for the Indian economy. Under his dynamic leadership, these institutions have transformed financial markets and introduced products and instruments that have captured the imagination of market players in India and abroad. I can say without any hesitation that Dr. Patil was peerless as an institution builder in the financial sector of India.

Dr. Patil was a multi-talented personality whose involvement was not limited to the financial sector. His contribution to the Disinvestment Commission is well known. He was on several RBI committees, including the Technical Advisory Committee on monetary policy. He was my guru in markets and I learnt a lot from him.

I selected the subject for today's memorial lecture after consulting many people[2], keeping in mind that it should be relevant to the promoter, the institution and the contemporary scene. Of course, it has something to do with reform of the financial sector. When we talk about the financial sector reforms, we generally focus on financial sector markets, institutions, instruments and the regulators. Often we forget the fact that the financial sector operates within the overall eco-system. The eco-system, in its broad sense, comprises not only of macro-policies like fiscal and monetary policy, but also the judicial system, the contract enforcement system, the credit culture, integrity of accounting, etc. In the reform process, these are undoubtedly important but are perceived as something that will not change in the medium term. But there is something else that is almost ignored in the debates on financial sector reforms, namely, financial market infrastructure. I intend addressing this issue today.

In the first part, I will explain the concept of financial market infrastructure followed by the impact of the global financial crisis on the priority accorded to it. I will then present in detail how the related reform was carried out in India. In the concluding part, I will explore the

[2] I am grateful for the invaluable collaboration with Mrs. Usha Thorat, the advice of Mrs. Shyamala Gopinath and Mr. G. Padmanabhan and assistance of the CCIL team in the preparation of this lecture.

major issues that should be considered in this regard and, in conclusion, flag some priorities and the way forward.

Financial Market Infrastructure

It is useful to think of the financial sector as comprising (a) the superstructure, which includes the monetary, fiscal, regulatory and legal frameworks; (b) the main structure viz. financial institutions, stock exchanges, market intermediaries, credit rating agencies, credit information companies; and (c) the foundation that facilitates these transactions such as payments and settlements systems, depositories, clearing corporations and trade repositories. These facilitators, the market infrastructure institutions, are not visible but are no less important than the superstructure or the structures themselves.

Financial Market Infrastructure (FMI) is defined by the Bank for International Settlements (BIS)/International Organization of Securities Commissions (IOSCO) as a "multilateral system among participating institutions, including the operator of the system, used for the purposes of clearing, settling, or recording payments, securities, derivatives, or other financial transactions." The term FMI generally refers to "systemically important payment systems, Central Securities Depositories (CSDs), Securities Settlement Systems (SSSs), Central Counter Parties (CCPs), and Trade Repositories (TRs) that facilitate the clearing, settlement, and recording of financial transactions."[3]

Traditionally, the system of FMI was largely left to central banks, who managed it with little public attention. That was in a relatively simple world of finance. However, the system came under stress after the explosion of sophistication and complexity in financial instruments in a globalised world of less than adequately regulated finance. In September 2008, suddenly the globally dominant players – around twenty of them – stopped trading with each other since they were not sure about the other's liquidity and solvency. How did this happen?

Global Crisis and focus on FMIs

In the events leading up to the crisis of 2008, market participants were able to use the leverage that the derivatives market gave them and build up huge positions, which enhanced the risks. The huge number of transactions undertaken by the dealers was bilateral in nature and even the regulators did not know the extent of net exposures of each dealer to other dealers in the system. Moreover, there was a complicated mechanism of margins being maintained on a bilateral basis which had to be periodically valued and called in bilaterally. The build up of

[3]http://www.bis.org/cpmi/publ/d101a.pdf

risky positions and the exposures that players had to each other resulted in the crisis assuming systemic proportions as disruptions at any one major dealer would soon transmit to other financial institutions and spread contagion to the entire market.

The global financial crisis has radically challenged our thinking in all areas –economic theory, monetary policy, fiscal policy, conduct of financial markets and financial regulation. It has also brought into focus the unbridled and unregulated growth in the over-the-counter (OTC) derivative market as a key exacerbating factor in the global financial crisis. The FMIs have come under the close scrutiny of global regulators to see how they can be used for greater transparency and risk mitigation. Specifically, there has been focus on setting up of central counterparties, trade repositories and legal entity identifiers.

The global financial crisis revealed important weaknesses not just in OTC derivatives but in many areas of our financial system. The regulatory reforms undertaken by the G-20 economies sought to address each of these in a manner that recognizes the interplay among them.

An important component of these reforms was a commitment to enhance the regulation of OTC derivatives markets so as to improve transparency, mitigate systemic risk and protect against market abuse. To this end, the G-20 decided, at the Pittsburgh Summit in September 2009, that:

"All standardized OTC derivative contracts should be traded on exchanges or electronic trading platforms, where appropriate, and cleared through central counterparties by end-2012 at the latest. OTC derivative contracts should be reported to trade repositories. Non-centrally cleared contracts should be subject to higher capital requirements."[4]

While there were very few CCPs before the crisis, especially those that cleared and settled OTC trades – derivatives in particular – the BIS estimates that at the end of 2016, 76 per cent of the interest rate derivatives market and 44 per cent of credit default swaps (CDS) were cleared by CCPs.

Indian Experience

When the NSE was set up, the need for a sound depository and clearing corporation was recognized. One cannot refer to these institutions without recalling Dr. Patil. His foresight and drive, as Managing Director NSE, enabled him to establish a solid foundation for the NSDL

[4]http://www.g20.utoronto.ca/2009/2009communique0925.html

and NSCCL, with best-in-class operating and risk management systems, that were on par or, in many cases, even better than in many stock exchanges of the world.

The background to the setting up of CCIL is interesting. Partly triggered by falling interest rates after 1998 and partly by the various reforms in the G-Sec markets, the number of trades increased exponentially. On many occasions, the settlement at the Public Debt Office of the RBI would not be completed till after midnight. Cash would come in from forex or money market transactions only at the end of the day. Sometimes there would be a gridlock and it became a nightmare.

The idea of novation and netting was beginning to gain ground then. The experience of the Government Securities Clearing Corporation in the United States and the London Clearing House was studied. Around the same time, BIS and IOSCO jointly set up the Committee on Securities Settlement Systems (1999-2001) in which India participated.

It was becoming quite clear to us that any system for clearing and settlement of securities had to have a sound legal basis and the risk management systems for liquidity risk and operational risk had to be robust. Taking into account the prevailing legal framework, it was felt that, using the Indian Contract Act 1872, a central counterparty would be the best way of solving the problem of settlement and gridlocks in the government securities markets. This would also be a logical step to setting up of the Negotiated Dealing System (NDS).

The CCIL commenced operations on 15 February 2002, the same day that the NDS came into operation. The M. G. Bhide Advisory Group on Payment and Settlement System, in its report submitted in July 2001, endorsed the setting up of the CCIL as well as the proposal that forex transactions could be cleared and settled by it. The RBI took steps towards establishing a forex clearing system with netting of interbank forex transactions and having a single pay in or pay out for each bank in US dollars. What began as an experiment, with hardly any examples to go by globally, has succeeded well beyond our expectations.

It is interesting to note that India was way ahead of the curve globally in creating a CCP that offered guaranteed settlement in the OTC cash and derivatives markets in money, government securities and forex. The attention of the global leaders to CCPs as institutions that enhance transparency and mitigate risk came only after the crisis.

An interesting aspect of financial sector legislation in India is that many reforms took place prior to the legal changes that were required. As alluded to earlier, although the legal basis for multilateral netting and finality of settlement was not robust in India, as a system

provider, CCIL initially used the membership form as the basis for entering into a contract with the participants. The form required the intending member bank to agree to abide by CCIL's Bye-Laws, Rules and Regulations, and this was enforced through the provisions of the Contract Act. Additionally, the system did not provide for any explicit law for regulation and supervision of the payment systems.

In order to address these issues, the RBI drafted the Payment and Settlement Systems Bill which would give the central bank explicit legal powers to regulate and oversee the payment and settlement systems in the country as well as provide legal recognition to multilateral netting and settlement finality. The Bill was enacted as a law – the Payment Systems Act, 2007 – and the regulations under it were notified in 2008. The Act also permitted the appropriation of collaterals by the system operator in case a payment system participant defaults in meeting its payment obligation due to liquidation or due to any other incapacity. In 2015, the Act was reviewed and amended to incorporate lessons learnt globally from the crisis of 2008.

I will now turn to certain important issues that are relevant in the context of FMIs. Let me start with the issues of competition ownership and governance of FMIs.

FMIs have certain attributes that are unique. The key attributes of FMIs are their public utility or essential services character, huge network effects, economies of scale and high sunk costs. In many cases, a FMI becomes a natural monopoly, as its attributes tend to inhibit competition. While the benefits of FMIs for enhancing transparency and minimising risk are well understood, there are risks generated because of their interconnected nature and externalities. Their monopoly or oligopoly character could lead to lower level of services, higher prices and under-investment in risk management. At the same time, excessive competition could also lead to lowering of risk standards.

The design of FMIs is, therefore, critical for public policy. Recognising these conflicting objectives, the Bimal Jalan Committee[5] on Review of Ownership and Governance of Market Infrastructure Institutions made certain important recommendations relating to ownership and governance. Only anchor institutional investors, defined as adequately capitalised public financial institutions and banks, should be eligible to own up to 15-24 per cent of stock exchanges. Depositories and clearing corporations should not own other classes of FMIs. The Committee was not in favour of listing. “Listing of an FMI brings with it advantages and disadvantages. On one hand, listing of an FMI provides an exit route to its shareholders, bringing transparency and better governance to the functioning of the FMI. However, on the

[5]http://www.sebi.gov.in/sebi_data/commondocs/marketinfraAnnexA_p.pdf

other hand, listing may also usher in more conflict of interests for the stock exchange, since monitoring its own listing related compliances or that of a related/competing FMI will be an issue." It suggested fixing a cap on the maximum return that can be earned by a FMI on its net worth and can be distributed/allocated to the shareholders of an FMI. Any return/profits above such maximum attributable amount would be transferred to the Investor Protection Fund (IPF) or Settlement Guarantee Fund (SGF), as the case may be, and the same would not form part of shareholders funds/net worth for the purposes of determining returns and book value of the shares. This would strengthen the FMIs' ability to withstand shocks, make them robust and could also lead to reduction of the charges levied by them on users. I think the fundamental principles underlying the Jalan Committee report are sound and need to be kept in mind.

In the beginning there were some suggestions that the RBI should have a stake or a golden share in CCIL, but this was not felt to be desirable in view of its role as regulator. The CCIL has been set up as a user-owned organisation, with banks and financial institutions – the users of the services it offers – as its shareholders. Unlike other models of ownership, the user-based ownership model provides sufficient incentives to the shareholders while, at the same time, placing some responsibilities on their shoulders. SWIFT and CLS Bank are organisations with a somewhat similar ownership structure. This model has found acceptance with the regulator, which has been insisting on its continuation.

Ever since its inception as a public limited company in April 2001, CCIL has been functioning as a public utility. While it has been making profits from the very first year, wholly commercial considerations and profits have not been the company's main objectives. In fact, it reduced user charges once in 2016. Given the public policy objectives and the other factors highlighted by the Jalan Committee, most real time gross settlement (RTGS) systems (another important FMI) in the world are publicly owned and in India even the National Payment Corporation of India (NPCI) was set up as a not-for-profit entity.

For FMIs that are for-profit institutions driven by shareholder interest, there could be conflict between ensuring sufficient capital buffers for risk and dividend distribution. In cases where users are the owners, there could be conflicts between minimizing risk and the additional call on them for margins, collateral, contribution to settlement guarantee fund etc. Hence, FMIs need to have governance and operating rules and regulations structure that put financial stability objective above all else.

Relationship with central banks

FMIs need access to a central bank account for providing settlement services. Where the government securities registry is with the central bank, as in many cases, the FMIs will need access to such depositories/registries. Several central banks already offer one or more services to CCPs, but there is no common international approach. Central banks in Europe, for example the Bundesbank, the Nederlandsche Bank and Banque de France, provide not only a direct account to the CCPs in their jurisdiction, but also manage their cash collateral through direct accounts of eligible clearing members and the CCP. Intra-day liquidity is provided under certain conditions and a link with the national central securities depository enables the use of securities as collateral. In 2013, the Board of Governors of the Federal Reserve in the United States approved a final rule relating to the opening and maintenance of accounts for designated financial market utilities, including CCPs, as well as the provision of services to these utilities, although the services do not include access to routine intra-day credit. In all these cases, the central bank also oversees the safety and efficiency of the CCPs.[6]

The issue of central bank liquidity to CCPs is a widely debated issue. On the one hand, as a recent International Monetary Fund (IMF) paper[7] has pointed out, there is the increased risk on account of the dependence of the CCPs on major banks (especially clearing banks) for liquidity. On the other hand, there is the view that such assurance from central banks could result in moral hazard. Collateralised liquidity is something central banks could consider either directly or on back-to-back basis. Uncollateralised liquidity is, however, a lender of last resort measure and when the CCP needs it, there obviously exists a systemic issue and will need to handled as part of crisis management.

Regulation of FMIs

Given the systemic significance of FMIs and their public utility objective, it is not surprising that regulators have been getting into this area right from the 1990 report of the Committee on Interbank Netting Schemes (Lamfalussy Report). As most FMIs are sponsored by the private sector, the approach of the global regulators has been to evolve principles to ensure that risks could be better monitored, measured, managed and controlled, and then spell out the responsibilities of central banks, securities regulators and other relevant authorities. Currently the global regulatory framework for FMIs is enunciated in the "Principles for Financial Market Infrastructure" (PFMI) – a comprehensive set of twenty-four principles and six responsibilities issued by the BIS and IOSCO forum in April 2012. The scope of PFMI is to

[6]https://www.imf.org/external/pubs/ft/wp/2015/wp1521.pdf
[7] https://www.imf.org/external/pubs/ft/wp/2015/wp1521.pdf

enhance safety and efficiency in payment, clearing, settlement, and recording arrangements and, more broadly, to limit systemic risk and foster transparency and financial stability.[8]

As FMIs – more specifically CCPs – are asked to shoulder more and more responsibilities in the post-crisis environment, and market participants are mandated to clear all their standardised derivative transactions through CCPs, the level of scrutiny of the operations of CCPs has increased manifold. As I had mentioned earlier, the regulators in most jurisdictions supervise the FMIs, both off site and on site, on the basis of their adherence to the PFMI. There is an active process of consultation between the FMIs and their regulators whenever new products are introduced, processes (including risk management processes) are changed and so on. Since some of the FMIs are designated as critically important FMIs, regulators supervise their operations more closely.

In India, FMIs are regulated by the Securities and Exchange Board of India (SEBI) and the RBI. SEBI regulates the capital markets and, therefore, the stock exchanges and the associated custodians, while RBI regulates the OTC markets that include forex, money, debt and related derivative markets, and, hence, institutions like CCIL and NPCI. The Board for Payments and Settlement systems was set up as a committee of the Central Board of RBI in 2005 and, after the Payments Systems Act was enacted, it has been incorporated in the legislation as the authority for authorising, prescribing policies and setting standards for regulating and supervising all the payment and settlement systems in the country.

There has been some debate in India recently on whether the function of regulating FMIs should continue with the RBI. Some committees have recommended that there should be an independent payments system regulator. There have also been recommendations that all financial markets (including money, forex and government securities, equities, commodities) should be with a unified market regulator and this function should be moved out of the RBI.

Globally, the central bank, as the monetary authority, creates and destroys money and is also the lender of last resort and, hence, is the designated payments system regulator. Over the years in India, too, this has been the case, and there does not seem to be any compelling reason to change this.

As for FMIs that are dealing with clearing and settlement functions, the issue of who should regulate them obviously depends on who is the regulator of the underlying instruments traded in these markets. The money, forex and government securities markets were in general regulated by central banks in advanced countries till the 1980s. It is true that these

[8] http://www.bis.org/cpmi/publ/d101a.pdf

countries have moved away from this model. But after the global crisis there is rethinking on the regulatory architecture, both in the theory and practice. At this stage, therefore, there is no compelling reason to move in a direction where there is uncertainty.

How do FMIs address risk in the system?

The benefits of CCPs are several and these explain the market-driven and regulatory push for CCPs. By netting and guaranteeing settlement, CCPs offer huge benefits to buyers and sellers. They overcome information asymmetry. They allow players to have just one counterparty that greatly facilitates their managing counterparty risk. CCPs offer margining and high standard risk management measures uniform across market participants. In a bilateral settlement there may be no such standards and could pose a risk. Multilateral netting offers huge efficiency and allows risk protection with smaller amount of collateral and liquidity. Finally, CCPs are able to mutualise losses in a transparent and predictable manner.

A CCP thus enables a safer and more efficient settlement of securities and derivatives transactions. There are, however, costs attached to the services of a CCP. As soon as a party can no longer meet its obligations, the CCP takes over these obligations. In order to fulfil this role, the CCP requests the transacting parties to deposit collateral. As a consequence, the assets used as collateral are temporarily unavailable for operational purposes.

In addition, the CCP requires an extensive and robust risk monitoring system. The parties that make use of a CCP's services pay for the implementation and maintenance of this system. These payments can essentially be seen as a kind of risk premium. Thus, CCPs will be used if the benefits from the increased number of transactions as a result of safer and more efficient securities and derivatives transactions are greater than the collateral and risk premium costs.

During the global crisis, CCPs proved to be of crucial value in diverse financial markets. For example, the collapse of Lehman Brothers in 2008 did not lead to the bankruptcy of any other trading and clearing members on the trading venues in which Lehman was involved. This was largely attributed to the intervention of several CCPs.[9]

While the pre-crisis use of CCPs was voluntary, post crisis the regulators are pushing markets – especially derivative markets – towards them. This also explains why the PFMI is constantly under review and why CCPs are under such close scrutiny.

[9]https://www.dnb.nl/en/binaries/711869_All_Ins_Outs_CCPs_EN_web_v3_tcm47-288116.pdf

Regulators have also been pushing jurisdictions to set up Trade Repositories (TRs) and use Legal Entity Identifiers (LEIs). The TRs provide transparency in markets that were previously quite opaque. Similarly, the LEI – a 20-character marker that identifies distinct legal entities that engage in financial transactions – is being adopted in all jurisdictions. The LEI is a global standard, designed to be non-proprietary data that is freely accessible to all and will provide much more transparency.

What risks do CCPs pose to the system?

Notwithstanding the numerous benefits of central clearing, its rise may be associated with a number of side effects. The obvious risk is concentration risk. CCPs are increasingly turning into institutions of unprecedented systemic importance. Their failure could lead to systemic disruptions, which is why, apart from sound risk management, an effective recovery and resolution regime for CCPs is the key. There is also the risk of interconnectedness between key CCPs, as global banks use national or regional CCPs. The risks need to be understood by the financial institutions that participate and rely on these CCPs. Third, owing to mutualisation, losses and liquidity shortfalls in the event of a member's default may spread to other participants. Crisis propagation may be further driven by interdependencies of changing complexity. These issues are being continuously reviewed by global regulators. I am happy that European Securities Markets Authority (ESMA) has reviewed the systems in CCIL and has recognised it as a Third Country CCP. This will enable European banks lower their capital on their exposures to CCIL.

Central Clearing vs. Distributed Ledger Technology?

The advantages of central clearing have by now been well understood both in stock exchanges and in the OTC markets. The new technology that could be potentially challenge the concept and practice of central clearing is what is known as the distributed ledger technology (DLT), best exemplified by blockchain.

Blockchain is essentially a database that provides proof of who owns what at any given moment and an immutable record of all transactions. As all parties to a set of transactions are able to maintain a record of the same, it removes the need for a separate intermediary. It is, in other words, a distributed ledger. A vast, globally distributed ledger running on millions of devices, it is capable of recording anything of value. For the first time in human history, two or more parties, be they businesses or individuals who may not even know each other, can forge agreements, make transactions and build value without relying on intermediaries, such as

banks, to verify their identities, establish trust, or perform the critical business logic — contracting, clearing, settling, and record-keeping.

There are three ways in which this technology is expected to work.

First, to replace physical currency. Bitcoin is an example of this. Several central banks are also looking at how they can eliminate the use of physical cash with crypto-currencies. The Scandinavian central banks seem to beactive in the movement to abolish paper currency. DLT could potentially replace the paper currency (banknotes), allowing central banks to open accounts to all individual economic non-financial agents such as households and corporations.

Second, for settlement of financial transactions. I understand that several large exchanges are exploring DLT-based solutions to improve existing post-trade processes for clearing and settling trades made on exchanges. Monetary Authority of Singapore (MAS), has, I have heard, set up a Smart Financial Centre and is developing PoCs (points of contact) for use of DLT for RTGS and cross-border settlement. Apparently, it is exploring this for trade finance and central bank-to-central bank settlements. I believe that it is also engaging with other central banks in the region.

In September 2017, the Bank of Japan (BOJ) and the European Central Bank (ECB) released the findings of their joint research project on the possible use of DLT for financial market infrastructures. They concluded that given the relative immaturity of the technology, DLT is not a solution for large-scale applications at this stage of development.

The Reserve Bank of Australia has similarly set up a research group to study blockchain, DLT and its uses and implications. I understand that the Bank of England is also working with fintech companies with a view to understanding the kind of applications under development and their implications for financial markets, and in turn, to lend the firms an insight into the kind of legal or regulatory challenges that the applications could pose.

Third, for non-financial transactions. Examples where applications are being tested are cloud storage, smart contracts, anti-counterfeiting, digital identity, supply chain, art and ownership, prediction markets and the Internet of Things.

In February 2017, in a paper that assessed the current status on DLT, global regulators - Committee on Payments and Market Infrastructures (CPMI) and IOSCO, stated that "developments to date suggest that DLT bears promise but that there is still a long way to go before that promise may be fully realised. Much work is needed to ensure that the legal underpinnings of DLT arrangements are sound, governance structures are robust, technology

solutions meet industry needs, and that appropriate data controls are in place and satisfy regulatory requirements. It also seems clear that changes and related efficiency gains are more likely to be incremental than revolutionary."[10] While it would appear that DLT is not a threat to central clearing at the current stage, FMIs and regulators in India could do well to keep monitoring the developments and also engage in some pilots while carefully assessing the applicability from time to time.

Way Forward

Given the public utility and essentiality character of FMIs, their monopoly or near-monopoly status, high externality, it is clear that the ownership and governance of such institutions are critical. Regulators need to be closely concerned with the governance of these institutions in the interest of financial stability, as a public policy objective.

Systematically important FMIs, I understand, are currently routinely covered as part of the Financial Sector Assessment Programs of the IMF/World Bank, but I would underscore the importance of self –assessment.

In conclusion, may I suggest that in view of the growing importance of FMIs, the RBI should include a section on FMIs in every Financial Stability Report?

Thank you.

[10]http://www.bis.org/cpmi/publ/d157.pdf