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## OTC Derivatives Market in India: Recent Regulatory Initiatives and Open Issues for Market Stability and Development

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**Working Paper No. 248**

**OTC Derivatives Market in India:  
Recent Regulatory Initiatives and Open  
Issues for Market Stability and Development**

**Dayanand Arora  
Francis Xavier Rathinam**

**April 2010**



**INDIAN COUNCIL FOR RESEARCH ON INTERNATIONAL ECONOMIC RELATIONS**

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## Foreword

Over-the-counter (OTC) derivatives are generally argued to be the root cause of the current global financial crisis. A common contention is that a large sum of money, at least 10 times the world GDP, is at stake in the OTC derivatives markets the world over. This paper is an attempt to clarify the real size of the OTC markets and their implications for the risk profile of the financial markets in which they operate. The OTC market in India, though in its infancy, is an interesting case, because it came out unscathed in the present global crisis. The paper seeks to prove the point that this is because of India's cautious regulatory framework and support institutions such as a centralised counter party (CCP). This case study about the Indian OTC derivatives markets can serve as a model for other developing countries.

The paper analyses the regulatory structure of the Indian OTC derivatives market, particularly the role of OTC-traded versus exchange-traded derivatives, the role of reporting platforms and the role of a centralized counterparty (CCP) for the transparent functioning of the market. It further explores some of the open issues, such as competition in reporting platforms and counterparty services and supervision of the off-balance sheet business of financial institutions, to ensure stable growth of OTC derivatives markets.



**(Rajiv Kumar)**

Director and Chief Executive

April 16, 2010

## **Abstract**

The OTC derivatives markets all over the world have shown tremendous growth in recent years. In the wake of the present financial crisis, which is believed to have been exacerbated by OTC derivatives, increasing attention is being paid to analysing the regulatory environment of these markets. In this context, we analyse the regulatory framework of the OTC derivatives market in India. The paper, inter alia, seeks to prove the point that the Indian OTC derivatives markets, unlike many other jurisdictions, are well regulated. Only contracts where one party to the contract is an RBI regulated entity are considered legally valid in India. A good reporting system and a post-trade clearing and settlement system, through a centralised counter party, has ensured good surveillance of the systemic risks in the Indian OTC market.

From amongst the various OTC derivatives markets permitted in India, interest rate swaps and foreign currency forwards are the two prominent markets. However, by international standards, the total size of the Indian OTC derivatives markets still remains small because credit default swaps were conspicuously absent in India until now. It appears that Indian OTC derivatives markets will grow fast once again after the present financial crisis is over. This research paper explores those open issues that are important to ensure market stability and development. On the issue of the much discussed competition between exchange-traded and OTC-traded derivatives, we believe that the two markets serve different purposes and would contribute more to risk management and market efficiency, if viewed as complementary. Regarding the introduction of new derivative products for credit risk transfer, the recent announcement by the RBI that it would introduce credit default swaps is a welcome sign. We believe that routing of credit default swaps through a reporting platform and managing its post-trade activities through a centralised counterparty would provide better surveillance of the market. Strengthening the position of the Clearing Corporation of India Ltd. (CCIL) as the only centralised counterparty for Indian OTC derivatives market and better supervision of the off-balance sheet business of financial institutions are two measures that have been proposed to ensure the stability of the market.

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***Keywords: Derivatives and Over the Counter Market, Financial Institutions and Services and Government Policy and Financial Regulation***

***JEL Classification: G1, G2 and G28***

# OTC Derivatives Market in India: Recent Regulatory Initiatives and Open Issues for Market Stability and Development<sup>1</sup>

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*“Blaming derivatives for financial losses is akin to blaming cars for drunken driving fatalities.”*

*- Christopher L. Culp*

## 1. Introduction

Since a vast majority of financial asset classes exist only in the over-the-counter (OTC) environment, OTC markets are viewed as critical to the effective functioning of national and global financial systems. Alongside and complementary to the organised exchange markets, OTC markets have a crucial role to play in all national and international economies.

The OTC derivatives markets all over the world, including in India, have shown tremendous growth due to their flexibility, low operating cost, zero regulatory costs, developments in information technology and, above all, due to high volatility in asset prices. However, in the backdrop of the present financial crisis, which is believed to have been exacerbated by OTC derivatives, a lot of attention is being given to analysing the possible regulatory structure of OTC markets to promote stability and, at the same time, ensure market efficiency. The competition between OTC and exchange-traded derivative markets is another issue for policy makers. We assume that this competition would drive all the players to minimise transaction costs and adopt best practices.

The present research work on OTC derivative markets seeks to achieve, inter alia, the following objectives:

- (i) To provide a brief introduction of the OTC derivatives market
- (ii) To formulate some stylised facts about global OTC markets
- (iii) To reflect upon the present regulatory initiatives of various national and multilateral bodies towards increasing the surveillance of the global OTC market
- (iv) To explain the regulatory framework, in which the Indian OTC derivative market operates
- (v) To give more details about the market structure, and
- (vi) To elaborate the open issues impacting new policy initiatives towards OTC and organised exchange derivatives markets.

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<sup>1</sup> An earlier version of this research paper was presented at the InWent /ICRIER Conference on “South Asian Financial Systems at Crossroads: Promoting Stability and Growth,” held in New Delhi, India on November 11, 2009. We gratefully acknowledge the comments of the conference participants and two anonymous referees. However, the usual disclaimer applies.

What this paper does not seek to provide is a separate assessment of credit, market, liquidity and funding risks inherent in the OTC derivatives markets. This would entail a detailed discussion of the tools for measuring these risks, analysing their impact and proposing remedial solutions. The main argument of the paper hinges on how central counterparties *CCPs reduce the counterparty and credit risks and how good supervision through a well-defined regulatory framework underpins the systemic risk.*

Section 2 of the paper provides a primer on the OTC derivatives market, along with some definitions. Section 3 explains why global OTC markets have gained in prominence. Section 4 offers some stylised facts about the global market, which seeks to correct some misnomers about the size of the market and its risk-potential. Section 5 briefly recounts recent policy initiatives on the global OTC markets. Section 6 describes the regulatory framework of the Indian OTC derivatives markets; it explains the recent regulatory initiatives of the Indian central bank towards improving the resilience of the Indian OTC derivatives market, including the central counterparty approach. Section 7 provides an assessment of major OTC derivative markets. Section 8 focuses on some of the open issues that need to be reviewed for any fresh policy review of the Indian OTC derivatives market and for improving the surveillance of the market. The last section provides a wrap up of the discussion with some concluding remarks.

## **2. A Primer on OTC Derivative Markets:**

A derivative is a risk transfer agreement whose value is derived from the value of an underlying asset. The underlying asset could be a physical commodity, an interest rate, a company's stock, a stock index, a currency, or virtually any other tradable instrument upon which two parties can agree.<sup>2</sup> Derivatives fall into two major categories. One consists of customised, privately negotiated derivatives, which are known generically as over-the-counter (OTC) derivatives. The other category consists of standardised, exchange-traded derivatives, known generically as *futures*.<sup>3</sup> "An over-the-counter (OTC) derivative is a bilateral, privately-negotiated agreement that transfers risk from one party to the other".<sup>4</sup>

The OTC derivatives market can be divided into five distinct categories:

- (1) Interest rate derivatives;
- (2) Foreign exchange derivatives;
- (3) Credit derivatives;
- (4) Equity linked derivatives ; and
- (5) Commodity derivatives

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<sup>2</sup> As defined in the International Accounting Standard, a derivative (IAS 39) is a financial instrument: (a) whose value changes in response to the change in a specified interest rate, security price, commodity price, foreign exchange rate, index of prices or rates, a credit rating or credit index, or similar variable (sometimes called the 'underlying'); (b) that requires no initial net investment or little initial net investment relative to other types of contracts that have a similar response to changes in market conditions; and (c) that is settled at a future date.

<sup>3</sup> The table in Appendix I explains the basic differences between exchange-traded futures and OTC traded forwards.

<sup>4</sup> ISDA (2009)

The most important products in the derivatives markets are interest rate derivatives (henceforth IRD), followed by foreign exchange derivatives (henceforth FED). Whereas the former accounted for 70 per cent of market value at the start of 2007, the latter had about 10 per cent of the market value. Credit default swaps (CDS), which became the third largest traded OTC product, accounted for seven per cent of market value. The derivatives relating to equity and commodities, taken together, account for 13 per cent of market value at the start of 2007.<sup>5</sup> This paper focuses primarily on the first three types in the above list. The equity linked and commodity derivatives are not included in this research work.

### **3. Why the Global OTC Derivatives Market is Important:**

The global OTC market has grown both in terms of size as well as in terms of its relative position vis-à-vis the exchange-traded derivatives market and the exchange-traded cash equities. Recent estimates by the Bank for International Settlement (BIS) put the notional value of the instruments traded on the global OTC derivatives market at \$684<sup>6</sup> trillion at end-June 2008.<sup>7</sup> The total size of the OTC market can be appreciated by comparing it with equivalent, exchange-traded derivatives. Thus, one estimate suggests that the global OTC derivative contracts were some eight times greater than the equivalent exchange traded derivatives.<sup>8</sup> It is interesting to note that the value of daily turnover in exchange traded derivatives in London is some 25 times greater than the value of daily turnover in exchange traded cash equities.<sup>9</sup> The global OTC derivatives market has also grown very fast; thus, the notional amount outstanding has increased from \$72 trillion in 1998 to \$684 trillion in June 2008.<sup>10</sup> However, several indicators suggest that the use of OTC in general, and that of CDS in particular, declined in the wake of the recent financial crisis.

One has to look at the economic significance of OTC derivatives to understand its contribution to the financial markets' efficiency. The following arguments are often given to support the growth of this market:

- (i) OTC markets promote the price discovery process in financial markets and hence, improve allocational and operating efficiencies of intermediaries and market participants.
- (ii) OTC markets provide liquidity to financial markets.
- (iii) OTC markets help in risk management inherent in underlying assets by transferring the risk to the party that can shoulder it the best.
- (iv) A well-developed OTC market would provide financial institutions with tools needed to manage risks associated with financial globalisation.
- (v) Currency and interest rate derivatives are important for monetary policy also.

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<sup>5</sup> Estimates based on Jones (2009)

<sup>6</sup> All \$ figures are in US dollars.

<sup>7</sup> The size of the market has fallen to \$592 trillion at the end of December, 2008 due to the global financial crisis. See BIS (2009) report on the global OTC derivative market activity for more details.

<sup>8</sup> According to BIS surveys, the notional value of all exchange-traded contracts was estimated at \$82.0 trillion at the end of June 2008

<sup>9</sup> Jones (2009), p. 5

<sup>10</sup> BIS (2008), p. 6



- (vi) Competition between OTC and exchange traded derivatives markets can drive players to minimise transaction costs and adopt better practices.

The enormous size and fast growth of OTC markets has attracted the attention of regulators/supervisors and market participants alike. The global OTC markets (particularly, some products, such as credit default swaps (CDS) or credit default obligations (CDO) are viewed by some as an amplifier of the stress in the present global financial crisis. The more common criticisms relate to the fact that OTC derivatives markets are less transparent, have more leverage, have weaker capital requirements and contain elements of hidden systemic risk.

#### 4. Stylised Facts on Global OTC

The facts and ideas mentioned in this section offer an insight into the riskiness of the OTC derivatives market. We use two main data sources<sup>11</sup> to prove that the risk volume in the OTC market is not based on the notional value of the outstanding contracts. The following stylised facts are relevant in this regard:

1. Nominal or notional amounts outstanding on all contracts (\$684 trillion as of end-June 2008 as per BIS statistics) are the gross notional value of all deals concluded and not yet settled on the reporting date. It provides a measure of market size and a reference point from which contractual payments are determined in a derivatives market. However, such amounts are generally not truly at risk. The amount at risk in derivatives contracts are a function of the price level and/or volatility of the financial reference index used in the determination of contract payments, the duration and liquidity of the contracts, and the creditworthiness of counterparties. **Gross market values** provide a more accurate measure of the financial risk transfer taking place in the derivatives markets. Thus, gross market values, which measure the cost of replacing all existing contracts, are a better measure of market risk than notional amounts. According to the BIS survey, the gross market value of the global derivatives markets was \$33.89 trillion as of end-December 2008.<sup>12</sup> It would be important to note that the gross market values at current market prices provide a measure of the economic significance that is readily comparable across markets and products.
2. The term “gross” in gross market values is used to indicate that contracts with positive or negative replacement values with the same counterparties are not netted, nor are the sums of positive and negative contract values within a market risk category set-off against one another. Thus, one has to find out the **gross credit exposure**, which represents the gross value of contracts that have a positive market value after taking account of legally enforceable bilateral netting arrangements. Gross credit exposure represents the aggregated market values and shows the payment flows at risk. According to the BIS surveys, the gross credit exposure of the global OTC

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<sup>11</sup> The statistics compiled by the Monetary and Economic department of the Bank for International Settlements (henceforth BIS) in its surveys of the global OTC derivatives market activity and by the International Swaps and Derivatives Association (ISDA) in its surveys of market participants.

<sup>12</sup> The largest increase in the gross market value between June 2008 and December 2008 occurred in the segment interest rate derivatives, where declining interest rates resulted in a notable 99 per cent increase in the gross market value to \$18.4 trillion. BIS (2009), p.1

derivatives market has increased from \$2.6 trillion as of end-June 2007 to \$5.0 trillion as of end-December 2008.<sup>13</sup> This reinforces the argument that the payment flows at risk increased and almost doubled during the period.

3. In a bilateral OTC contract, where market participants trade directly with one another, management of counterparty risk – the risk that the person or firm on the other side of the deal will fail to live up to what is contractually agreed – has two components: *collateral* and *bilateral netting*.<sup>14</sup> In the collateral component, the parties limit the counterparty risk by requiring the daily posting of collateral reflecting the mark-to-market value of the contracts. Collateral agreements can be customised to reflect the contracting parties' assessment both of the riskiness of the position and of each other's credit quality. The posting of collateral implies that actual counterparty exposures are smaller than market values would suggest. Surveys conducted by the International Swaps and Derivatives Association (ISDA) indicate that roughly two-thirds of OTC derivatives exposures are collateralised and the estimated amount of collateral in use at the end of 2008 was approximately \$4.0 trillion.
4. The uncollateralised part of the market shows the true exposure, with a high potential for credit risk and so-called "ripple-effects". If we collate the numbers from the previous points, the gross credit exposure came to \$5.0 trillion at the end of 2008. Of that, an estimated \$4.0 trillion was in collateral, while the uncollateralised OTC derivatives exposure at the end of 2008 came to about \$1.0 trillion. It is this part of the OTC market, which supervisory authorities need to focus on for surveillance.
5. Cash is the most common form of collateral used in the global OTC derivatives market and it continues to grow in importance. It stood at almost 84 per cent of collateral received and 83 per cent of collateral delivered during 2008. The use of government securities as collateral also grew in 2008, with nine per cent of collateral received and 15 per cent of collateral delivered in 2008 being in the form of government securities.<sup>15</sup> Other forms of collateral, such as corporate bonds and equities, were used less during the year. Most collateral agreements amongst firms were with hedge funds and institutional investors (50 per cent) followed by corporates (15 per cent) and banks (13 per cent).
6. Concentration in the global OTC derivatives market appears to have risen in recent years, although it remains low on average. Concentration tends to be the lowest in foreign exchange and interest rate derivatives, where the Herfindahl index (HI)<sup>16</sup> is in the range of 400 to 700 in the major currencies. Such values are below what some economists would consider an

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<sup>13</sup> BIS (2009), p. 7

<sup>14</sup> The term "gross credit exposure" mentioned in point 2, shows the impact of bilateral netting. Implicitly, bilateral netting helps reduce collateral requirements! The ISDA survey (2009) indicates that virtually all large banks rely on some form of bilateral netting agreement to control counterparty exposure.

<sup>15</sup> ISDA (2009, p.4)

<sup>16</sup> The Herfindahl index represents a measure of market concentration and is defined as the sum of the squares of the market shares of each individual institution. It ranges from 0 to 10000. The more concentrated the market, the higher the measure becomes. If the market is fully concentrated (only one institution), the measure will have the maximum value of 10000.

oligopolistic market.<sup>17</sup> It is relevant to note that the most active players, who are end users in the market, are large international banks, securities firms and multinational companies. The fact that there are fewer participants in the market hints at the wholesale character of the market.

7. In the five OTC derivatives markets (mentioned in Section 2), the euro is either the predominant currency or the second most important currency after the US dollar. BIS reports that the US dollar is the predominant currency in the OTC foreign exchange derivatives with a 42 per cent share in the notional amounts outstanding. In the interest rate swaps, 36 per cent of the market was denominated in euro.<sup>18</sup> The transactions by counterparties located in the European Union (EU) represent a sizable share of the OTC derivatives markets. The counterparties located in euro area countries handled \$308 trillion or 36 per cent of the total global business.
8. The global OTC derivatives market is concentrated largely in the United Kingdom, which has 43 per cent of the overall market by value and the United States, which has 24 per cent.<sup>19</sup> Most of the cross-border OTC derivatives are concentrated in G-10 countries, though the exposure of the residents of emerging markets has increased over time.<sup>20</sup>

## **5. Recent policy Initiatives on Global OTC market: CCP as the Most Dominant Solution**

In the context of the recent financial market turbulence, concerns regarding the limited development of post-trading infrastructure for OTC derivatives have intensified. It is argued often that the lack of a good post-trading infrastructure not only implies operational inefficiencies and risks but also hampers effective counterparty risk management and market transparency.<sup>21</sup> Because of the large size of the OTC derivatives markets and their close linkage with cash markets, these markets seem to have acted as a contagion channel during the recent financial market turbulence. Against this background, measures to improve market organisation in general, and to strengthen the post-trading infrastructure of the OTC derivatives markets, in particular, have gained momentum during 2009.<sup>22</sup>

The introduction of Centralised Counter Parties (CCPs) for OTC credit derivatives<sup>23</sup> has turned out to be the most common initiative for lowering counterparty risks and improving transparency in the market. A CCP is an independent legal entity, which interposes itself between the buyer and seller of a derivative security. When trading through a CCP, the single contract between two initial counterparties, which is the

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<sup>17</sup> A market with nine dominant firms of equal market share, having a joint market share of 80 per cent, would have an HI of just over 700 and an HI of 500 would correspond to 13 dominant firms. .

<sup>18</sup> European Central Bank (2009, p. 16)

<sup>19</sup> Jones (2009) p. 1

<sup>20</sup> The share of exposure to emerging market countries appears to be trending up. A survey of US data on counterparty credit exposure arising from derivative contracts estimated the exposure to the residents of emerging markets at 8 per cent. See Sally (2009) for details.

<sup>21</sup> ECB (2009) p. 7

<sup>22</sup> These measures are in line with the mandate of the Financial Stability Forum. See Report of the Financial Stability Forum on Enhancing Market and Institutional Resilience. 7<sup>th</sup> April 2008.

<sup>23</sup> Central counterparties for other OTC derivatives, such as interest rate swaps, have been in place for a decade (SwapClear, a UK-based CCP for interest rate swaps was established in 1999), and those for futures have, in some cases, been around for more than a century.

hallmark of an OTC trade, is still executed. However, it is replaced by two new contracts – between the CCP and each of the two contracting parties. At this point, the buyer and seller are no longer counterparties to each other – instead, each acquires the CCP as its counterparty. The structure has three clear benefits:

- (a) It improves the management of counterparty risk;
- (b) It allows the CCP to perform multilateral netting of exposures as well as payments<sup>24</sup>; and
- (c) It increases transparency by making information on market activity and exposures – both prices and quantities – available to regulators and the public.<sup>25</sup>

One crucial characteristic of a CCP is that it mutualises credit and market risk, spreading it among all its participants. However, the capacity of a CCP to absorb risk is determined by:

- (i) the equity capital injected by owner-members
- (ii) the margin it collects and
- (iii) the practice of marking positions to market

Existing derivatives CCPs generally collect an initial margin from its members to cover potential future exposure in the event that a clearing member defaults. The initial margin, which is a form of collateral, is delivered typically either in cash or in the form of securities that have high credit quality and can easily be sold. CCPs control risks by marking positions to market and requiring that a variation margin be paid and received each day. In periods of high volatility, positions may be marked to market intraday to limit the size of uncollateralised exposures.<sup>26</sup>

Introducing CCPs would improve transparency by allowing for easy collection of high frequency, market-wide information on market activity, transaction prices and counterparty exposures for market participants, who rely on them. The centralisation of information in a CCP makes it possible to provide market participants, policymakers and researchers the information to better gauge developments in various markets on the position of individual market participants.<sup>27</sup>

The year 2009 has witnessed the introduction of several new CCPs for credit default swaps (CDS) and more are likely to follow. In the United States, ICE Trust (owned by the Intercontinental Exchange (ICE)) became operational in March 2009.<sup>28</sup> In Europe, two CCPs – ICE Clear Europe and Eurex Credit Clear – began operations at the end of July 2009. A third CCP, LCH Clearnet, is expected to become operational by the end of 2009. These CCPs for CDSs focus on making it possible for market

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<sup>24</sup> In 2008, multilateral netting facilitated by third party operators, such as TriOptima and CreditEx eliminated more than \$30 trillion of CDS notional principal, which was about three-fourths of total outstanding amounts at the end of the year.

<sup>25</sup> Cecchetti, Gynthelberg and Hollanders (2009) p. 46

<sup>26</sup> The information in this section draws upon the work done by Cecchetti, Gynthelberg and Hollanders (2009) on the CCPs.

<sup>27</sup> Cecchetti, Gynthelberg and Hollanders (2009) p.51

<sup>28</sup> Until very recently, CDSs were cleared solely on a bilateral basis.

participants, in particular for larger dealers, to reduce counterparty exposures to the more actively traded, single-name CDS contracts and to standardised CDS indices. It is relevant to note that information on outstanding trades in the CDS market are now stored in a centralised trade data warehouse. The Depository Trust and Clearing Corporation (DTCC) established a trade information warehouse (TIW) in November 2006 to provide a comprehensive trade database containing the primary record of each CDS contract and is, therefore, a key source of industry statistics for public authorities and markets alike. According to its own assessments, DTCC's data warehouse stores all electronically confirmed CDS trades and about 96 per cent of all global CDS trades.<sup>29</sup>

## **6. OTC Derivatives Market in India: The Regulatory Framework<sup>30</sup>**

Given the nature of the derivatives market, a sound regulatory framework that defines financial infrastructure, product design and scope for innovation is inevitable. Such a regulatory framework would define the market participants, the counterparties, the nature of products and transactions, the method of clearance and settlement and, ultimately, the level of risk in the market as a whole. Further, it would also enable the regulator to collect market information from primary sources. Saxena<sup>31</sup> states, "emergence of derivatives market will normally require legislation, which addresses issues regarding legality of derivatives instruments, specifically protecting such contracts from anti-gambling laws because these involve contracts for differences to be settled by exchange of cash, prescription of appropriate regulations and powers to monitor compliance with regulation and power to enforce regulations". Thus, understanding the historical evolution of regulatory initiatives is critical to understand the market microstructure, problems and prospects for future reforms.

Though some kind of OTC derivatives trading was prevalent in India in the pre-independence era, the Securities Contract Regulation Act 1956 (SCRA) had banned all kind of derivatives trading in India to curb detrimental speculation in securities. Further, forward trading in securities was banned in 1969. There were two influential committees constituted, namely the L C Gupta committee and J.R Varma Committee, to review the need for and to develop a regulatory framework for derivatives trading in India. The former, set up by SEBI in November 1996, has strongly favoured "the introduction of financial derivatives in order to provide the facility for hedging in the most cost-efficient way against market risk", especially "equity derivatives, interest rate derivatives and currency derivatives". Further, the committee recommended that the derivatives be declared as "securities" under SCRA. On the regulatory structure, the committee maintained that there is need for "exchange-level regulation by ensuring that the derivative exchanges operate as effective self-regulatory organisations under the overall supervision of SEBI". The committee has also suggested by-laws for derivatives exchanges and clearing corporations. Other

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<sup>29</sup> European Central Bank (2009) p.21

<sup>30</sup>For regulatory purposes, derivatives have been defined in the Reserve Bank of India Act, as follows: "derivative" means an instrument, to be settled at a future date, whose value is derived from change in interest rate, foreign exchange rate, credit rating or credit index, price of securities (also called "underlying"), or a combination of more than one of them and includes interest rate swaps, forward rate agreements, foreign currency swaps, foreign currency-rupee swaps, foreign currency options, foreign currency-rupee options or such other instruments as may be specified by the Bank from time to time.

<sup>31</sup> Saxena (2003), p.282

important suggestions include the establishment of a separate clearing corporation, mark to market margins, maximum exposure limits, mandatory registration of brokers with SEBI and specification of capital adequacy for brokers. The second Advisory Committee on Derivatives under the chairmanship of Prof. J. R. Varma in 1998 had discussed the measures to mitigate the risk in derivatives trading, especially for single stock futures, stock options and index futures. Both the committees are of the view that stock exchanges, due to transparency, settlement guarantee and better risk management, are better equipped to undertake trading in derivatives.

The ban was revoked subsequently and a number of derivatives such as currency options, interest rate and currency swaps and commodities futures were introduced. Further, the legal impetus came when the Securities Contracts (Regulation) Amendment Bill was introduced in the Lok Sabha in 1998. Subsequently, the SCRA was amended in 1999 to include derivatives in securities so that the derivatives<sup>32</sup> could also be traded on the exchanges and the regulatory mechanisms that are already in place for securities trading would be applicable for derivatives as well.

The regulatory structure of the OTC derivatives market at present in India is as follows: The Reserve Bank of India Act, 1936 (as amended on 2006) empowers RBI to regulate OTC products such as interest rate derivatives, foreign currency derivatives and credit derivatives. Thus, all exchange-traded derivatives are regulated by the respective exchanges and overseen by SEBI whereas the OTC traded derivatives are completely within the purview of the RBI.

The RBI, through its guidelines had introduced interest rate swaps (IRSs) and forward rate agreements (FRAs) to be traded in the OTC markets since 1999 “with a view to further deepening the money market as also to enable banks, primary dealers and all-India financial institutions to hedge interest rate risks”.<sup>33</sup> The RBI Technical Advisory Committee Report on Interest Rate Futures states, “In the wake of deregulation of interest rates as part of financial sector reforms and the resultant volatility in interest rates, a need was felt to introduce hedging instruments to manage interest rate risk. Accordingly, in 1999, the Reserve Bank of India took the initiative to introduce OTC interest rate derivatives, such as IRS and FRA<sup>34</sup>.”

### ***6.1 OTC Derivatives Market in India: Recent Regulatory Initiatives***

The Reserve Bank of India (Amendment) Bill, 2006 has legalised all derivatives trading where at least one of the parties in a transaction is a RBI regulated entity. To start with, RBI has allowed all scheduled commercial banks (SCBs) excluding Regional Rural Banks, primary dealers (PDs) and all-India financial institutions to use IRS and FRA for their own balance sheet management and non-financial corporations

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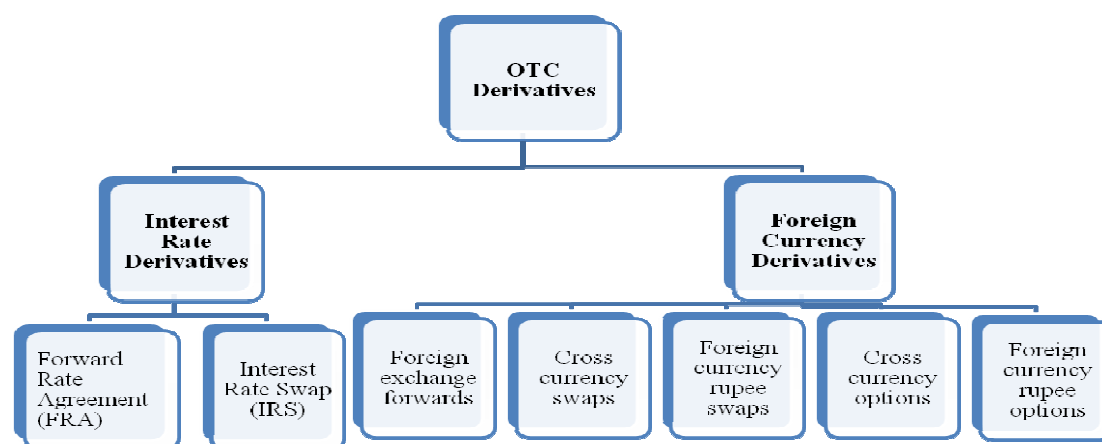
<sup>32</sup> The Securities Laws (Amendment) Act, 1999 has formally defined derivatives as, “(a) a security derived from a debt instrument, share, loan whether secured or unsecured, risk instrument or contract for differences or any other form of security, and (b) a contract which derives its value from the prices or index of prices or underlying securities.” (starting 22-02-2000). Further, the amendment states, “Notwithstanding anything contained in any other law for the time being in force, contracts in derivative shall be legal and valid if such contracts are, (a) traded on a recognised stock exchange; (b) settled on the clearing house of the recognised stock exchange, in accordance with the rules and bye-laws of such stock exchange”.

<sup>33</sup> Ref.No. MPD.BC.187/07.01.279/1999-2000

<sup>34</sup> RBI (2008) available at <http://rbidocs.rbi.org.in/rdocs/PublicationReport/Pdfs/86253.pdf>

to use IRS and FRA to hedge their exposures. Though this limits the depth of the market, it provides some kind of transparency in the market and enables the regulator to assess the level of leverage from the mandatory disclosure of the regulated entities. The graph below shows the OTC derivative products permitted in India:

**Graph 1: OTC Derivative Products Permitted in India**



Further, as part of a gradual liberalisation process, comprehensive guidelines for derivatives trading in India were released by the RBI in 2007-08. The guidelines aimed to lay down the general principles for derivatives trading, management of risk and sound corporate governance requirements, which also include a conduct code for market makers.

## **6.2 Indian Approach to Centralised Clearing:**

The RBI issued a notification on a reporting platform for OTC interest rate derivatives in 2007 stating that, “it is necessary to have a mechanism for transparent capture and dissemination of trade information as well as an efficient post-trade processing infrastructure for transactions in OTC interest rate derivatives, to address the attendant risks”. It was announced in this context that, to begin with, CCIL<sup>35</sup> would start a trade-reporting platform for rupee interest rate swaps. The notification states<sup>36</sup>:

1. “CCIL has developed a reporting platform in this regard, which would capture the transactions in OTC interest rate derivatives (interest rate swaps and forward rate agreements (IRS/FRA)). The platform would be operationalised by August 30, 2007.
2. All banks and primary dealers are required to report all their IRS/FRA trades on the reporting platform within 30 minutes from the deal time.
3. Client trades are not to be reported.

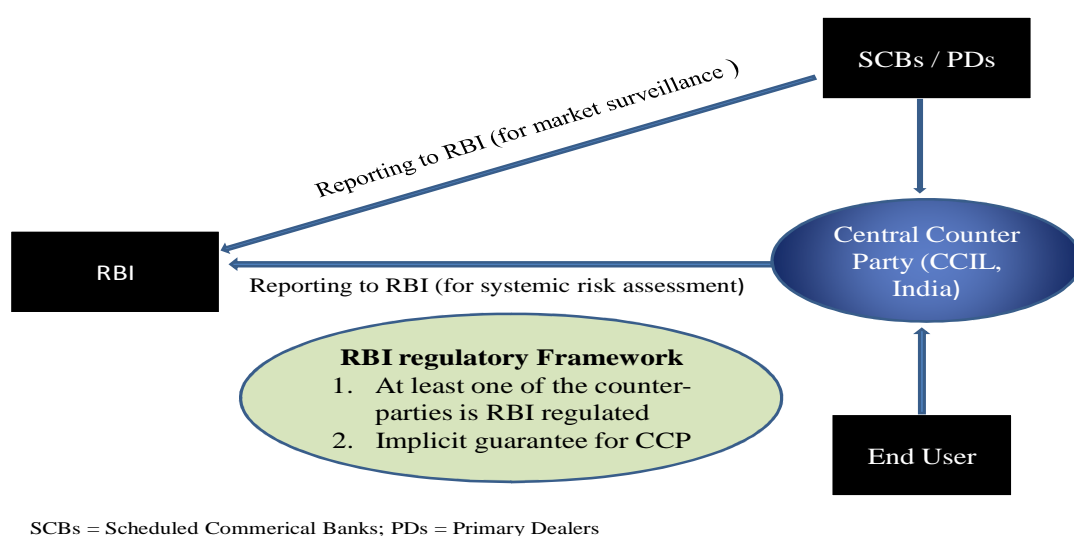
<sup>35</sup> The Clearing Corporation of India Ltd. (CCIL) promoted by State Bank of India (SBI), Industrial Development Bank of India (IDBI), ICICI Ltd., LIC (Life Insurance Corporation of India), Bank of Baroda, and HDFC Bank, started in 2002 to boost the efficiency of and safety in debt and forex markets in India. CCIL clears, settles and functions as the central counterparty to all trade in both spot and forward markets in both debt and foreign exchange.

<sup>36</sup> DMD/11.08.15/809/ 2007-08 available at <http://rbi.org.in/scripts/NotificationUser.aspx?Id=3780&Mode=0>

4. Banks and primary dealers (PDs) may also ensure that details of all the outstanding IRS/FRA contracts (excluding the client trades) are migrated to the reporting platform, by September 15, 2007.
5. Detailed operational guidelines in this regard would be made available by CCIL”.

As per the guidance of RBI, CCIL has commenced the functioning of its reporting platform for transactions in OTC interest rate derivatives i.e. IRS and FRA in 2007 and non-guaranteed settlement of OTC rupee derivatives in 2008.

**Graph 2: CCP Approach: Regulatory Framework for Indian OTC Derivatives**



Graph 2 is a flow chart showing the CCP approach within the regulatory framework for the Indian OTC market. Introducing CCIL as the central counter party in OTC derivatives post-trading clearance has been viewed as an important milestone for Indian money markets. Since one of the counterparty in an OTC transaction has to be an RBI regulated entity and has to report to it on a regular basis, the Indian model provides an automatic surveillance on OTC exposure of all banks in India. Additionally, the use of CCIL as a reporting platform on a real-time basis helps the RBI keep a real-time watch on systemic risk.

Depending on RBI-stipulated capital requirements, the CCP guarantee would reduce capital requirements for banks up to 80 per cent by eliminating the counterparty risk.<sup>37</sup> Some believe that “with CCIL guarantees, the volume should go up in these markets... as there is no counter-party risk involved”.<sup>38</sup> At present, CCIL collects initial margin (including spread margin), mark to market margin and other margins like volatility margin (whenever imposed). Such margins are collected in the form of eligible Government of India securities and /or cash. A minimum cash margin requirement is generally stipulated to address immediate liquidity needs. CCIL also

<sup>37</sup> In the case of foreign currency forwards, the capital reduction can be as high as 90 per cent.

<sup>38</sup> Roy (2009)



takes contribution from members to the default fund in specific segments in the form of eligible Government of India securities to meet any residual loss.<sup>39</sup>

The RBI (2009) states “with a view to accessing complete information on this segment of the market, it has now been decided to collect the details of client trades in respect of IRS transactions. Accordingly, SCBs and PDs are advised to report the IRS transactions entered into with their clients in the format enclosed on a weekly basis”.<sup>40</sup> Further, RBI requires all trading parties “to submit counter party and contract wise marked to market (MTM) values of derivative (viz., forwards, swaps, FRA, futures, options, credit derivatives, etc.) contracts on gross basis (i.e., positive as well as negative market/fair values) in equivalent US dollars with details of currency of settlement, country of the counter party, country and sector of ultimate risk, to their respective head/principal offices”.

The RBI annual report 2009 states that “a clearing and settlement arrangement on a non-guaranteed basis has been put in place for the OTC interest rate derivatives trades since November 27, 2008. By March 2009, 13 members participated in the non-guaranteed settlement of OTC rupee interest-rate derivatives”.<sup>41</sup>

Risk management at the CCIL is a high priority because the organisation is systemic. The RBI, recognising the systemic nature of CCP, ensured that CCIL is closely monitored. Further, to eliminate the possibility of CCIL not being able to honour a contract, it maintains a guarantee fund and has adequate lines of credit arrangements with various banks to ensure funds settlement on guaranteed basis for trades in Collateralised Borrowing and Lending Obligations (CBLO), government securities and forex markets. To ensure good corporate governance, CCIL follows International Organisation of Securities Commission (IOSCO) best practices<sup>42</sup>.

## **7. Present Structure of the OTC Derivatives Markets in India:**

There is no comprehensive source for assessing the total volume of transactions carried out on the Indian OTC derivatives market. Therefore, the information presented in this section draws upon various sources and is an attempt to assess the Indian OTC derivatives market under two major groupings: interest rate derivatives and foreign currency derivatives. Since the markets for interest rate swaps (in the category of interest rate derivatives) and foreign currency forwards (in the category of foreign currency derivatives) enjoy significant position in the Indian OTC space, the following description is related mostly to these two markets. A brief description of the credit derivative swaps (CDS), which are not permitted in India so far, is given in the section on open issues.

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<sup>39</sup> Information obtained from CCIL

<sup>40</sup> see RBI notification on "Reporting of OTC Interest Rate Derivatives – Client Level Transactions" FMD/MSRG/40 /01.14.001/2009-2010 available at: <http://rbidocs.rbi.org.in/rdocs/notification/PDFs/COTCI051009.pdf>

<sup>41</sup> RBI (2009)

<sup>42</sup> RBI (2007) reports that "CCIL's risk management practices are periodically evaluated against recommendations for CCP [by IOSCO]" page 24 of "Report on Oversight of Payment Systems in India".

## **7.1 Interest Rate Derivatives (IRDs)<sup>43</sup>:**

IRDs were introduced in India when the RBI permitted banks/FIs/PDs to undertake interest rate swaps/forward rate agreements in July 1999. IRDs have been slow to emerge in India. An OTC market has sprung up primarily involving interest rate swaps (IRS)<sup>44</sup> and forward rate agreements (FRA).<sup>45</sup>

### **7.1.1 Interest Rate Swaps:**

A single currency interest rate swap is an exchange of cash flows between two counterparties based on predetermined specifications. It is an obligation between them for exchange of interest payments or receipts on investments in the same currency on an agreed amount of notional principal at regular intervals over an agreed time period. In the case of rupee IRS, banks, primary dealers and financial institutions are allowed to enter into swaps for the purposes of hedging their exposure as well as for market making. Other corporate customers are allowed to enter into rupee IRS only for the purpose of hedging the interest rate risk on an underlying asset/liability. In the case of non-rupee IRS, all participants are allowed to enter into these transactions only to hedge an underlying exposure. Market quotations for swaps are usually quoted against standard benchmark/index rates and non-amortising notional principal, free from the margin actually payable in the cash market by the relevant counterparties. The rate is thus quoted flat and any amortising structure that envisages a customised rate is adjusted accordingly. The Reserve Bank of India has allowed scheduled commercial banks, primary dealers and all-India financial institutions to make markets in IRS since July 1999 to deepen the money market and to enable these institutions to hedge interest rate risks. However the market, which has taken off seriously so far, is the overnight index swaps (OIS)<sup>46</sup> based on Mumbai Interbank Offered Rate (MIBOR) benchmark. (See Table 1 for details). MIBOR-based OIS accounts for over four-fifth of this market and has registered significant growth (14 fold) over the last four years. Other benchmarks (such as MIFOR<sup>47</sup> and INBMK<sup>48</sup>) and benchmarks of tenor beyond overnight have not become popular due to the absence of a vibrant inter-bank term

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<sup>43</sup> As interest rates have fallen in India, companies have swapped their fixed rate borrowings into floating rates to reduce funding costs.

<sup>44</sup> In an interest rate swap, a counterparty may receive a floating rate (linked to a benchmark rate) and pay a fixed rate.

<sup>45</sup> A forward rate agreement allows a party to lock in the interest rate.

<sup>46</sup> The Overnight Index Swap (OIS) is an INR interest rate swap where the floating rate is linked to an overnight inter-bank call money index. The swap is flexible in tenor, i.e., there is no restriction on the tenor of the swaps. The interest would be computed on a notional principal amount and settled on a net basis at maturity. On the floating rate side, the interest amounts are compounded on a daily basis based on the index.

<sup>47</sup> MIFOR (Mumbai Interbank Forward Offered Rate) is the yield based on forex forward premiums; Reuters publishes 1m,3m,6m 1yr MIFORs, which are the market standard for this benchmark.

<sup>48</sup> Another benchmark, which is gaining popularity in recent times is called INBMK; it is an acronym for Indian benchmark rate published by Reuters. This effectively presents a yield for government securities for a respective tenor.

money market.<sup>49</sup> This is viewed as an area of concern for the long-term efficiency of the market.<sup>50</sup>

**Table 1: Interest Rate Swaps - Outstanding Notional Principal**

*(Benchmarkwise Details)*  
*(Amount in Rs. Crore)*

Item/Year	March 2005	March 2006	March 2007	March 2008
Total	10,81,867	18,29,700	37,07,342	80,18,647
<i>% Growth (Y-o-Y)</i>		<i>69</i>	<i>103</i>	<i>116</i>
MIBOR/OIS	4,76,744	10,75,917	27,37,244	66,93,065
<i>% Share in total</i>	<i>44.07</i>	<i>58.80</i>	<i>73.83</i>	<i>83.47</i>
<i>% Growth (Y-o-Y)</i>		<i>126</i>	<i>154</i>	<i>145</i>
MIFOR	5,64,262	7,01,305	8,72,000	12,54,255
<i>% Share in total</i>	<i>52.16</i>	<i>38.33</i>	<i>23.52</i>	<i>15.64</i>
<i>% Growth (Y-o-Y)</i>		<i>24</i>	<i>24</i>	<i>44</i>
INBMK	20,070	34,110	82,103	48,574
<i>% Share in total</i>	<i>1.86</i>	<i>1.86</i>	<i>2.21</i>	<i>0.61</i>
<i>% Growth (Y-o-Y)</i>		<i>70</i>	<i>141</i>	<i>-41</i>
Others	20,792	18,369	15,995	22,753
<i>% Share in total</i>	<i>1.92</i>	<i>1.00</i>	<i>0.43</i>	<i>0.28</i>
<i>% Growth (Y-o-Y)</i>		<i>-12</i>	<i>-13</i>	<i>42</i>

Notes:

MIBOR: Mumbai Inter-Bank Offer Rate

MIFOR: Mumbai Inter-Bank Forward Offer Rate

OIS: Overnight Index Swap

INBMK: Indian Benchmark

Source: RBI

The total volume of transactions in the above table is based on the outstanding notional amounts, which provides a measure of market size and a reference point for contractual payments. However, such amounts are not truly at risk.<sup>51</sup> To get a more accurate picture of the financial risk transfer taking place in the derivatives markets, one should analyse the gross market values. The gross market value of all IRS contracts on December 10, 2009, as estimated by CCIL, was \$16.9 billion.<sup>52</sup> If we assume that 80 per cent of the IRS contracts have an embedded netting agreement<sup>53</sup>, the gross credit exposure would be approximately \$1.69 billion (See Table 2 for details). Furthermore, if we assume that two-thirds of the derivative exposure is

<sup>49</sup> The NSE publishes MIBOR (Mumbai Interbank Offered Rate) rates for three other tenors viz., 14-day, 1month and 3 month. The other longer tenor benchmark that is available is the yield based on forex forward premiums. This is called MIFOR (Mumbai Interbank Forward Offered Rate). Reuters published 1m,3m,6m 1yr MIFORs are the market standard for this benchmark.

<sup>50</sup> CFSA (2009) p.217

<sup>51</sup> Refer to Section 4 for details on this point.

<sup>52</sup> The rupee data from CCIL was converted at the exchange rate of INR46.6 to a US \$.

<sup>53</sup> If all of these IRS contracts have no embedded netting agreements, the gross credit exposure of all IRS contracts would be 50 per cent of \$16.87 billion. According to the definition, on an aggregated basis, the total of marked to margin positive values and negative values should be equal, because the loss of one party is a gain for the other.

collateralised, only \$556 million worth of exposure is uncollateralised. It is this amount, which represents the potential credit risk and needs to be monitored carefully. With the continuous growth of the OTC markets, a trend analysis of the uncollateralised exposures will give a better perception of the market.

**Table 2: Computation of Gross Credit Exposure in IRS Market**

	<i>(Billion \$)</i>	
	<b>Global IRS*</b>	<b>Indian IRS*</b>
Gross Notional Value of IRS contracts (GNV)	328,114	733.82
Gross Market Value (GMV)	16,573	16.87
GMV as a % of GNV	5.05%	2.30%
Gross Credit Exposure (GCE) before netting	8,286	8.44
GCE as a % of GMV	50%	50%
Gross Credit exposure (Assuming that 80 percent of the contacts are netted out)	1,657	1.69
Potential Credit Risk (Assuming that 67 percent of the exposure is collateralized)	547	0.56

*\*The values do not include potential future exposure*

*The data for Global IRS is as of December 2008*

*The data for Indian IRS is as on 10.12.2009*

*Source: BIS (May 2009) for the Global IRS Market and CCIL for Indian IRS Market*

When we analyse the activities in the IRS in terms of active participants, it is striking that foreign banks dominate the IRS (MIBOR) market – they accounted for about 80 per cent of the deals carried out during November 2009, followed by private banks operating in India.<sup>54</sup> The competitive advantage of foreign as well as private banks could be traced to their expertise in this area and the use of appropriate technology for the purpose.

CCIL started reporting transactions of OTC interest rate swaps (IRS) through its reporting platform from 2007. The monthly data provided by CCIL reveals that the growth in the notional amount of IRS based on both MIFOR and MIBOR started decelerating from the beginning of the year 2008. Thus, the IRS derivatives segment started shrinking as year-on-year growth rates turned negative in the peak of the financial crisis. Even though the Indian financial sector does not have direct exposure to toxic assets abroad, the derivatives market does get severely affected through expectations (created by uncertainty in the market) and through a credit crunch (due to drying up of foreign funds).

#### *7.1.2 Forward Rate Agreement (FRA):*

A forward rate agreement (FRA) is an agreement to lend/borrow money for a specified period on a notional principal on a particular date in the future at a rate that is determined today. It is like a forward contract where the underlying is a loan or

<sup>54</sup> CCIL (2009), p. 11

deposits, both notional. FRAs are OTC contracts. The difference between the FRA rate and the actual market rate on the maturity date is paid by one party to the other. If the market rate is higher than the FRA rate, the seller pays the buyer whereas in case of market rate being lower than the FRA rate, the buyer pays the seller. All FRAs are executed as OTC deals between two counterparties who are comfortable trading with each other. These can also be intermediated by a broker. In either case, each counterparty takes on the credit risk of the other, typically for durations of two weeks to six months. The reference rate that is typically used to settle these products, are short-term rates that are polled from the market using a methodology similar to that of LIBOR. Of these, the NSE Mumbai InterBank Offer Rate (MIBOR) polled by the NSE is a well-known benchmark.<sup>55</sup>

Despite the fact that FRAs were given regulatory clearance, the interbank segment of this is completely absent in India due to illiquidity in this market. One possible reason could be the lack of a suitable benchmark rate for this market.

The market of IRS and FRA is likely to get a new impetus with the CCIL's proposal to provide guaranteed settlement for IRS and FRA trades in the near future.

## ***7.2 Foreign Currency Derivatives:***

The origins of the Indian foreign exchange market can be traced to 1978 when banks were permitted to undertake intra-day trading in foreign exchange. However, the market started growing only after the liberalisation process picked up in 1992. The continuous improvement in market infrastructure has had its impact in terms of the enhanced depth, liquidity and efficiency of the foreign exchange market. The turnover in the Indian foreign exchange market has grown significantly in both the spot and derivatives segments in the recent past. The daily average turnover saw a substantial pick up from about \$5 billion during 1997-98 to \$18 billion during 2005-06. The turnover has risen further to \$49 billion during 2007-08.<sup>56</sup> The inter-bank to merchant turnover ratio<sup>57</sup> has halved from 5.2 during 1997-98 to 2.6 during 2005-06 reflecting growing participation in the merchant segment of the foreign exchange market.

The foreign exchange (forex) market is divided into two segments: OTC (which includes spot, forwards and swaps) and exchange-traded currency futures. In June 2009, the size of India's forex market was estimated to have a turnover of \$34 billion per day: of this, the OTC forex market was estimated to have a daily turnover of \$33 billion while the exchange-traded currency futures market stood at \$1 billion.<sup>58</sup> As shown in Table 3, within the OTC segment, the spot market has remained the most important one, accounting for 50 per cent of the total turnover in 2007-08.<sup>59</sup> Foreign exchange swaps are the dominant form of OTC derivatives accounting for over 30 per cent of the total turnover, followed by forwards (12 per cent of the total turnover) in

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<sup>55</sup> Shah, Thomas and Gorham (2009), p.93

<sup>56</sup> The compounded annual growth rate (CAGR) was close to 25 per cent between 1997-98 and 2007-08. See CFSA (2009) p.202

<sup>57</sup> Merchant segment of the foreign exchange market shows transactions with parties other than banks and inter-bank segment shows transactions with banks, including RBI.

<sup>58</sup> IDFC SSKI (2009) p. 45 and 113.

<sup>59</sup> The share of the spot market has declined marginally in recent years due to a pick up in the turnover in the derivatives market

2007-08. Rupee-foreign exchange options, which were allowed in July 2003, have remained insignificant despite being in existence for more than six years.

**Table 3: Indicators in the Foreign Exchange Market Activity**

<b>Indicator/Year (Apr-Mar)</b>	<b>1997-98</b>	<b>2005-06</b>	<b>2007-08</b>	<b>2008-09</b>
Total Annual Turnover (\$ in Billion)	1,306	4,404	12,305	12,092
Average daily turnover (\$ in Billion)	5.0	18.0	49.0	48.0
Inter-bank to Merchant segment ratio	5.2	2.6	2.5	2.7
Spot/ Total Turnover (percent)	51.4	50.5	49.7	45.2
Forward/ Total Turnover (percent)	12.0	19.0	12.6	21.1
Swap/ Total Turnover (percent)	36.5	30.5	31.1	33.6
FCY/INR in Total Turnover (percent)	66.2	64.9	60.0	65.5

*Source: RBI*

It is important to note that foreign institutional investors (FIIs) are able to do transactions on the currency derivatives market but only “hedging” of the currency risk exposure on their Indian investment is permitted.

#### *7.2.1 Foreign Currency Swaps:*

Foreign currency swap is an arrangement where the two counterparts agree to exchange streams of cash flow and payments over a period of time to achieve overall cost reduction for both parties. As shown in Table 3, foreign currency swaps are the largest segment of foreign currency derivatives and account for a third of the total turnover in the OTC segment. Resident Indians having a long-term forex or rupee exposure may enter into foreign currency-rupee swap under the condition that there is a limit of \$50 million on swap facilitating customers to assume a forex liability.

#### *7.2.2 Foreign Currency Forward Market:*

**The Rupee-Dollar Forward Market (R-D FM).** This market is both onshore and offshore, though the offshore market is not as large as the onshore. In the onshore market, approximately 120,000 forward transactions came to CCIL for settlement in 2008-09, with notional values of a little over \$1 trillion. After reaching a peak average daily volume of \$7.6 trillion in March 2008, the market has slowed down considerably and the average daily volume has fallen to \$4.5 trillion in March 2009 and to less than \$3 trillion at the end of November 2009.<sup>60</sup> This partly reflected the strengthening of prudential regulations effected by the RBI on off-balance sheet exposure (three-fourth of which is accounted for by forward exchange contracts) of the SCBs.<sup>61</sup>

The R-D FM accounts for about 30 per cent of the total forex market in 2008-09.<sup>62</sup> The market is dominated by foreign banks,<sup>63</sup> which have strong experience in forex

<sup>60</sup>CCIL Fact Book 2009, p.97-98

<sup>61</sup> The prudential regulations included, among others, a strengthening of the capital adequacy norms for off-balance sheet transactions. RBI (2009) p.121

<sup>62</sup>CCIL (2009)

<sup>63</sup> 62 per cent of the forex market trades were attributed to foreign banks in the year 2008-09.

business and use more advanced technology for the purpose. There are three remarkable features about the Indian currency forward market.

- a. Even though trading is negotiated off-exchange, there is netting by novation at CCIL to eliminate credit risk.
- b. Even though it is an OTC market, it trades standardised contracts that expire on the last business day of each month.
- c. Ordinarily, currency forward markets have pricing that is controlled by the covered interest parity (CIP). However, the system of capital controls involves considerable barriers on CIP arbitrage. Hence, the forward rate often strays away from the fair value.

The CCIL has started guaranteed settlement of foreign exchange forward trades (with a residual maturity of up to 13 months) from December 1, 2009. The proposed settlement process has been approved by RBI. Once CCIL starts guaranteed settlement of forwards from the trade date, banks will not have any counterparty exposure for these trades and, as a result, will have significant benefit in terms of a reduction in their inter-bank counterparty exposures. They will also have significant savings from capital requirements to support such trade.<sup>64</sup>

**The Offshore Non-Deliverable Forwards (NDF) Market.** In addition to the onshore R-D FM, there is active trading in cash-settled rupee-dollar forwards on what are termed non-deliverable forwards (NDF). The NDF markets in the Indian rupee (INR NDFs) have grown in volume and depth over time. While these are largely concentrated in Singapore, they also exist in London and New York. NDF turnover is estimated at \$0.5 to \$0.75 billion a day, compared with \$1.5 billion a day for the onshore R-D FM. The typical quote depth on both markets is \$5 million. The spread on the onshore market is roughly 0.5 to 1.0 paisa (a rupee has 100 paise), while the offshore NDF market has a spread between 0.5 and 2.0 paise.<sup>65</sup> These derivatives allow multinational corporations, portfolio investors, hedge funds and proprietary foreign exchange accounts of commercial and investment banks to hedge or to take speculative positions in local currencies.<sup>66</sup> The demand for NDFs arises principally out of regulatory and liquidity issues of the underlying currencies. The requirements that transactions in the onshore market must only be for the purpose of hedging has made the NDF market interesting to entities who are prevented from making transactions in onshore market.<sup>67</sup>

## **8. Open Issues for Market Stability and Development:**

As mentioned in Section 3, the enormous size and fast growth of the global OTC derivatives market has attracted the attention of regulators and supervisory bodies. Some OTC derivatives have been viewed as amplifiers of the stress in the present global financial crisis. The more common criticisms relate to the fact that the OTC markets are less transparent and highly leveraged, have weaker capital requirements and contain elements of hidden systemic risk. In section 5, we mentioned some of the recent policy initiatives that have been taken to improve market organisation and to strengthen the post-trading infrastructure of OTC derivatives.

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<sup>64</sup> CCIL (2009), p.19

<sup>65</sup> Prices in the NDF market embody useful information content about market expectations of potential pressures on the exchange rate.

<sup>66</sup> Onshore financial institutions are not allowed to transact in the NDF markets.

<sup>67</sup> Shah, Thomas and Gorham (2009) p. 156

In this section, we would like to focus our attention on the Indian OTC derivatives market and deliberate on measures that would help ensure more stability and yet contribute to the development of the market. Knowing the functional value of the OTC markets in the Indian financial system, we are not proposing any new initiatives at tightening of the regulatory rope. Instead, we propose increased disclosure, greater transparency and more standardisation as superior measures for improving surveillance.

### ***8.1 Competition with the Exchange-traded Derivatives***

A general view emerging after the recent financial crisis is that OTC derivatives trading should be moved to an exchange platform. The proponents of this view hope that this would increase liquidity and reduce significantly the opacity of the market. They argue that exchanges provide transparent and reliable price formation mechanisms, neutrality, robust and appropriate technology, better regulation and, above all, centralised clearing and settlement. These arguments are based on the assumption that the existing method of trading in OTC products is all based on telephone trading and there is no clearing system in place. If telephone trading were to be replaced with electronic trade processing and confirmation and if all contracts were to be settled through centralised clearing, the advantages of organised exchange-traded derivatives are equally available in the OTC market. The following three arguments clearly show that OTC and exchange-traded products cater to completely different needs of different market participants:

- (i) Exchanges are designed to be accessible to retail as well as wholesale customers. The level of regulation on exchanges is tight because it is essential to protect the retail customer. The OTC derivatives markets are totally wholesale and are used by professionals (financial institutions and institutional investors), who work with the latest risk-management tools.
- (ii) Exchanges are complementary to the OTC markets. A recent survey of futures vs. forward trading in India revealed that a majority of the forward trades were concentrated in the tenor of 6 months to one year. As against this, trade in futures has largely been confined to near one-month contracts, accounting for about 90 per cent of all futures since September 2008.<sup>68</sup> Additionally, even the purpose of participation in the two markets appears to be different. Thus, the Indian OTC forward market is primarily used by hedgers with physical exposure whereas the futures market is apparently used mostly for arbitrage and speculation purposes.<sup>69</sup>
- (iii) Exchanges specialise in highly standardised products, many of which started life as an OTC product and, as they became more standardised and therefore, highly liquid, were capable of being traded on an organised exchange. Many of the products currently traded OTC are highly customised or are semi-standardised. It is very unlikely that single-entity CDS could ever be traded on an organised exchange.

Therefore, the major issue is not competition between these two markets, where one form of organisation (the organised and regulated exchange) is trying to win over the other form of organisation (the opaque and unregulated OTC market). It is instead an

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<sup>68</sup> Lingareddy (2009), pp.5-6

<sup>69</sup> Op cit., p.9



issue of using one market (OTC market) as a fertile ground for financial product innovation and testing their potential until they are established and standardised enough to be traded on the organised exchange. The riskiness inherent in innovative products may make the OTC products a bit more expensive than exchange-traded products. As these products mature, they are also traded at spreads similar to exchange traded products. The two markets serve different purposes, very much like a standard and a customised furniture market.

## **8.2 New Derivatives Products for Credit Risk Transfer (CRT):**

Credit risk transfer (CRT), in a broad sense (including guarantees, loan syndication, and securitisation), has a long history. However, there has been a sustained and rapid growth of new and innovative forms of CRT associated with credit derivatives.<sup>70</sup> The most common credit derivatives are credit default swaps (CDS) on single corporate entity (single-name CDS) and collateralised debt obligations (CDOs). Since 2005, CRT activity became significant for two additional underlying asset classes – asset-backed securities (ABS) and leveraged loans.<sup>71</sup>

Internationally, banks and financial institutions are able to protect themselves from credit default risk through the mechanism of credit derivatives. However, credit derivatives were not allowed in India until recently. The RBI has made an announcement in its second-quarter monetary policy 2009-10 that it has considered it appropriate to proceed with caution on this issue. To start with, RBI proposes to introduce a basic, over-the-counter, single name CDS for corporate bonds for resident entities, subject to safeguards. It is envisaged that all CDS trades will come to a centralised reporting platform and, in due course, will be brought on a central clearing platform. Though no further details are available on the subject, it is assumed that commercial banks and primary dealers would be allowed to participate in the market as protection buyers and sellers. The protection buyer will be asked to prove credit exposure as underlying for using this market. Bankruptcy, obligation default, obligation acceleration and repudiation/moratorium will most likely be the credit events forcing the protection seller to shoulder the risk.<sup>72</sup>

This should be viewed as a good development because the CDS market provides the most objective tool for pricing of credit risk. The 2007 Percy Mistry committee<sup>73</sup> report on making Mumbai an international financial centre had observed that there is a large credit derivative market overseas on Indian debt. In the newly proposed liberal regime, the overseas credit derivatives markets could shift to India.

We believe that there is no intrinsic problem with CDS. The problems associated with CDS in the US and elsewhere in Europe were because of flaws in market design. As mentioned in section 5, the introduction of CCPs for OTC credit derivatives has turned out to be the most common initiative for lowering counterparty risks and improving transparency in the market. If CDS trade in India is initially routed through

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<sup>70</sup> Credit derivatives are off-balance sheet financial instruments, traded mostly over the counter, that permit one party (beneficiary) to transfer credit risk of a reference asset, which it owns, to another party (guarantor) without actually selling the asset. It, therefore, unbundles credit risk from the credit instrument and trades it separately.

<sup>71</sup> BIS (2008), p.4

<sup>72</sup> Whether restructuring will be included in the list of credit event is not clear!

<sup>73</sup> Mistry (2007) p. 153

a reporting platform and, later, if a CCP is allowed to perform the post-trade activities for CDS, many of the risks associated with it could be managed efficiently. Insisting on compliance with the ISDA master agreement would help accelerate the standardisation of the market.

There is a new and significant use of the CDS, which was pioneered by the German development bank called KfW. Through its creation of a securitisation platform (called PROMISE), the KfW has allowed banks that originate loans to small and medium-sized enterprises SMEs to sell the credit risk on their loans (without selling the loans) as CDS. The KfW pools the CDS of various originating banks and packages the same into credit linked notes (CLN) and sells these to the capital market through its securitisation platform called PROMISE. This allows capital market investor to buy the credit risk of the SME loans, freeing the originating bank from the risks and making it easier for them to provide SMEs access to credit.<sup>74</sup>

### 8.3 Increased Off-Balance Sheet Exposure of Indian Banks

The growth of derivatives as off-balance sheet (OBS) items of Indian Banks has been an area of concern for the RBI. The OBS exposure has increased significantly in recent years. The notional principal amount of OBS exposure increased from Rs.8,42,000 crore at the end of March 2002 (approximately \$181 billion at the exchange rate of Rs.46.6 to a US \$) to Rs.149,69,000 crore (approximately \$321 billion) at the end of March 2008. (See Table 4)

**Table 4: Off-Balance Sheet Exposure of Scheduled Commercial Banks in India\***

Item	2007-08	% of Total	2008-09	% of Total	% Change (Y-O-Y)
<b>Forward Exchange Contracts</b>	1,08,76,228 [251.4]	75.0%	79,15,211 [151.0]	74.2%	-27%
<b>Guarantees Given</b>	2,95,506 [6.8]	2.0%	4,17,064 [8.0]	3.9%	41%
<b>Acceptances, Endorsements, etc.</b>	33,26,853 [76.9]	22.9%	23,39,686 [76.9]	21.9%	-30%
<b>Total of all Contingent Liabilities</b>	<b>1,44,98,587</b> <b>[335.1]</b>	<b>100</b>	<b>1,06,71,961</b> <b>[203.6]</b>	<b>100</b>	<b>-26%</b>

\* *Scheduled Commercial Banks (SCB) include the State Bank Group, Nationalised Banks, Other Public Sector Banks, Private Sector Banks and Foreign Banks*

Source: RBI: *Report on Trend and Progress of Banking in India, 2008-09*, p. 300

The spurt in OBS exposure is mainly because of derivatives, whose share accounts for three-fourth of the total. The derivatives portfolio has also undergone a change, with single currency IRS comprising 57 per cent of the total portfolio as of end-March 2008 from less than 15 per cent as of end-March 2002.<sup>75</sup> It is interesting to note that foreign banks have the largest share (70 per cent as of end-March 2008) of OBS exposure of all SCBs. The forward contracts, where foreign banks and new private

<sup>74</sup> For more details, refer to the website of the KfW Bank at: [www.kfw.de/EN\\_Home/Loan\\_Securitisation/ KfWs\\_Securitisation\\_Platform](http://www.kfw.de/EN_Home/Loan_Securitisation/KfWs_Securitisation_Platform)

<sup>75</sup> RBI, (2009), p.244

banks were a counterparty, was 90 per cent of all forward contracts at the end of March 2008, reflecting the concentration in the OTC derivative market. Forward contracts declined by 27 per cent as of end-March 2009, reflecting a strengthening of the prudential regulations effected by RBI.

We conducted a detailed survey of the off-balance sheet activities of major SCBs in India to measure the participation of these banks during 2008 and 2009 in both the currency and interest rate derivatives markets for hedging and trading purposes.<sup>76</sup> We also tried to figure out the aggregated marked-to-market (MTM) position of these banks and their credit exposure in both markets at the end of March 2008 and 2009. Though the results of our survey do not give the total picture, it may be interpreted as representative of the behaviour of the major commercial banks in India. A summary of the data is given in Table 5:

**Table 5: Participation of SCBs in the Indian Derivatives Market**

(US \$ million)

	<b>2009</b>	<b>Percent</b>	<b>2008</b>	<b>Per cent</b>
<b>(Notional principal amount)</b>				
<b>For Hedging</b>				
Currency derivatives	3593.63	18.0%	3299.48	20.9%
Interest rate derivatives	16342.44	82%	12523.40	79%
<b>Total of Hedging (A)</b>	<b>19936.07</b>	<b>100%</b>	<b>15822.88</b>	<b>100%</b>
<b>Hedging as a % of (A + B)</b>		<b>3%</b>		<b>2%</b>
<b>For Trading</b>				
Currency derivatives	225170.03	32.9%	113487.92	16.2%
Interest rate derivatives	458400.26	67%	586120.30	84%
<b>Total of Trading (B)</b>	<b>683570.29</b>	<b>100%</b>	<b>699608.22</b>	<b>100%</b>
<b>Trading as a % of (A + B)</b>		<b>97%</b>		<b>98%</b>
<b>Total of Hedging and trading (A+B)</b>	<b>703506.36</b>		<b>715431.10</b>	
<b>Marked to market positions</b>				
<b>Assets (+)</b>				
Currency derivatives	7518.53		1618.37	
Interest rate derivatives	2465.09		113.75	
<b>Liability (–)</b>				
Currency derivatives	2646.60		8.47	
Interest rate derivatives	2571.72		214.64	
<b>Credit exposure</b>				
Currency derivatives	21208.46	61%	9340.82	59%
Interest rate derivatives	13400.02	39%	6393.99	41%
<b>Total of Credit Exposure</b>	<b>34608.48</b>		<b>15734.81</b>	

Source: Annual Reports of 15 Scheduled Commercial Banks

<sup>76</sup> The off-balance sheet records of following 15 banks (given in alphabetical order) were included in the survey: Axis Bank, Bank of India, BNP Paribas, DBS, Deutsche Bank, Federal Bank, HDFC Bank, HSBC, ICICI Bank, IDBI, Indusind Bank, Karnataka Bank, Kotak Mahindra Bank, State Bank of India, Yes Bank. The inclusion of these banks in the survey depended upon the availability of their off-balance sheet details on the web.

The following conclusions were drawn about the off-balance sheet exposure of the SCBs:

- (i) Over 97 per cent of the notional amounts assigned to derivatives in the OBS was for trading and not for hedging. Two-thirds of the notional amount in the category of trading activities in 2009 (and over three-fourth in 2008) was for trading in interest rate derivatives. The rest was accounted for by currency derivatives. The dominance of trading has a clear and positive impact on aggregate market liquidity. However, this should not negatively impact hedging activities in OTC markets.
- (ii) In the category of hedging activities, banks again had a larger participation in interest rate derivatives; about 80 per cent of total hedging activities in the derivatives markets were again in the interest rate derivatives market. This conforms to bankers' need for asset and liability management (ALM).
- (iii) Gross market values of the derivatives, showing the total replacement cost (obtained by "marking to market") of all contracts, had a larger positive value in currency derivatives than in interest rate derivatives.
- (iv) Currency derivatives seem to have contributed more to the credit exposure of banks, making these derivatives riskier from a credit risk perspective.<sup>77</sup>
- (v) The survey does not reveal what part of the total derivatives business is OTC and which kind of derivatives business is more profitable. Only the State Bank of India mentions that all of its derivatives business is OTC in nature.<sup>78</sup>

The growth of derivatives in the OBS business of SCBs is likely to be managed by an accompanying regulatory and supervisory framework, both at the national and international levels. In December 2009, the Basel Committee on Banking Supervision (BCBS) issued consultative proposals for strengthening the resilience of the banking sector. One of the consultative proposals is that the risk coverage of the capital framework will be strengthened. In addition to the trading book and securitisation<sup>79</sup> reforms announced in July 2009, the Committee is proposing to strengthen the capital requirements for counterparty credit risk exposures arising from derivatives, repos, and securities financing activities. These enhancements will strengthen the resilience of individual banking institutions and reduce the risk of shocks being transmitted from one institution to the next through the derivatives and financing channels. The strengthened counterparty capital requirements may also increase incentives to move OTC derivatives exposure to central counterparties and exchanges.

<sup>77</sup> In order to calculate the credit exposure equivalent of off-balance sheet interest rate and exchange rate instruments under current exposure method, an FI would sum:

- (i) the total replacement cost (obtained by "marking to market") of all its contracts with positive value (i.e., when the FI has to receive money from the counterparty), and
- (ii) an amount for potential future changes in credit exposure calculated on the basis of the total notional principal amount of the contract multiplied by the following credit conversion factors according to the residual maturity of the contract :

<i>Residual Maturity</i>	<i>Conversion Factor to be applied on Notional Principal Amount</i>	
	<i>Interest Rate Contract</i>	<i>Exchange Rate Contract</i>
Less than one year	Nil	1.0 %
One year and over	0.5%	5.0 %

<sup>78</sup> State Bank of India(2008-09), p. 136

<sup>79</sup> Securitisation laws in India do not allow Indian banks to 'originate to distribute' as in the US. This has considerably reduced Indian banks' activities in securitising loans and related moral hazards.

However, some studies suggest that changes in capital regulation had no consistent impact on the adoption of off-balance sheet products.<sup>80</sup> The attractiveness of the OTC business is guided more by a “high-return” motive and is not deterred by the low capital charge on it. Evidently, the routing of the trade and settlement process of the OTC derivatives component of OBS business through centralised clearing may be more effective. This would impart more transparency to the market as well.

#### ***8.4 Strengthening the Centralised Clearing Parties:***

As mentioned in section 6.2, CCIL, which started functioning in 2002, is the *only* centralised clearing party for trade processing and settlement services in India. It currently provides a guaranteed settlement facility for government securities trading, clearing of collateralised borrowing and lending obligations (CBLO), guaranteed settlement of foreign exchange trading, and settlement of all IRS. Though the concentration of business relating to money, securities and forex markets with the CCIL helps in pooling risks and reducing the overall transactions costs for the system, the CFSA report opined that the concentration of such a wide spectrum of activities leads to concentration of risks in one entity.<sup>81</sup> The report feared that the inadequacy of their risk management can have system-wide implications, which could be more destabilising than the decentralised systems. Concentration can also lead to a “moral hazard” problem if the central counterparty is considered “too big to fail”.

We believe that, given the systemic significance of CCPs and the existing concentration of activities in CCIL, the time has come to allow competition in post-trade clearing and settlement of OTC derivatives. Very much like in the market for foreign currency futures, where National Stock Exchange (NSE) and MCX compete as organised exchange-based CCPs, one should start thinking about new infrastructure in OTC derivatives. The entry of one or two more CCPs in the business of post-trade clearing and settlement may bring with it the advantages of operational efficiency and, at the same time, reduce the concentration of risk.<sup>82</sup>

Another measure that could contribute to the strengthening of CCPs relates to increasing liquidity requirements of CCIL. As part of its operations, CCIL sometimes experiences intra-day liquidity shortfalls. To tide over the intra-day liquidity requirements, CCIL has availed of a dedicated line of credit from a few commercial banks. We are endorsing the demand of the CFSA for the grant of a limited purpose banking license, which will enable CCIL to avail of a repo window with another bank or from the RBI to meet the need for additional liquidity. In a recent research paper,<sup>83</sup> Professor Ashima Goyal notes that clearing houses require cash reserves. She believes that OTC users normally pledge assets and not cash in swap deals, and are resisting

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<sup>80</sup> Ghosh (2003), p. 4

<sup>81</sup> CFSA (2009), p.272

<sup>82</sup> Divergent views exist on the benefits of competition between and amongst CCPs. Even in the developed countries, experience suggests that the multiple CCPs model does not provide margin efficiency and, in fact, increases the operational cost for members. Such countries are seeking to achieve margin efficiency through interoperability. The regulators have tried to encourage interoperability in the last few years to ensure that the mergers do not go beyond the national level so that supervision remains efficient. However, interoperability created or had the potential to create another monster of one CCP having huge exposure to another CCP leading to the possibility of spread of systemic risk from one geographic location to another in case of failure.

<sup>83</sup> Goyal (2009), p.13.

additional cost. She suggests that alternative credit arrangements could be developed with members of clearing houses.

## **9. Summary and Conclusions:**

The present work is a country study of the regulatory framework of the Indian OTC derivatives markets. The research work analyses the present market structure and reflects upon the regulatory initiatives taken by the Reserve Bank of India towards better surveillance of OTC markets. In addition to that, the research work focuses on four open issues impacting the stability and development of the market.

The major findings of the study are the following:

- (i) The notional value of OTC contracts is not a true measure of risk. It is the gross market value, measuring the cost of replacing all existing contracts, which shows market risk. However, for analysing the payment flows at risk, a still better measure is the gross credit exposure, which shows the aggregated market value of OTC contracts after bilateral netting has been completed.
- (ii) In the Indian context, the OTC derivatives markets are well regulated by the central bank. The RBI has legalised OTC derivatives trading, where at least one of the parties in a transaction is a regulated entity. RBI allows financial institutions to use derivatives for their own balance sheet management and non-financial firms to use derivatives for hedging their exposures. A centralised counter party, called CCIL, is entrusted with the job of engaging in the OTC derivatives market as a reporting platform and a clearing agency for post-trading settlements. The CCP approach offers a unique model for automatic surveillance of the OTC exposure. Recently, the guarantee offered by CCIL on some OTC products has gone a long way in reducing the capital requirements for the banks.
- (iii) A review of the market structure reveals that interest rate swaps (in the category of interest rate derivatives) and foreign currency forwards (in the category of foreign currency derivatives) occupy dominant positions in the Indian OTC derivatives markets. The market for IRS is primarily an overnight market and products of tenure longer than overnight have not become popular because of the absence of a vibrant inter-bank term money market. The dominance of foreign banks is an important characteristic of this market. The market for foreign currency forwards is basically a rupee-dollar forward market, where CCIL provides guaranteed settlement of the forward trades. There is also an off-shore NDF market in rupee-dollar forwards.
- (iv) For better surveillance of the OTC markets, we propose strengthening of the CCP approach. However, at present, India has only one institution for the purpose. This has created concerns relating to concentration risk. The entry of one or two new CCPs for post-trade clearing and settlement should ensure competition and bring in the advantages of operational efficiency.
- (v) For further development of the OTC markets in India, introducing new derivative products for credit risk transfer will be a positive step. In concrete terms, this would mean introducing credit default swaps. The problems

associated with these instruments could be reduced by routing them through a reporting platform and using a CCP for trade clearance and settlement.

In conclusion, the Indian OTC derivatives market did not contribute, directly or indirectly, to the global financial crisis. The policy implication of our research is that, unlike the new regulatory initiatives in the United States and European Union towards more regulation of the OTC derivatives markets, Indian OTC markets are reasonably well regulated. Knowing the functional value of OTC derivatives markets in the Indian financial system, there is no need for new moves to tighten the regulatory rope. Instead, what we need is a concerted effort towards increased disclosure, more transparency and more standardisation.

More research is needed to analyse the contribution of the OTC derivatives markets in improving financial market efficiency. It is still not very clear how far the Indian OTC derivatives markets have helped in price discovery in the spot markets. The anecdotal evidence seems to suggest that the impact of OTC market prices on price-finding in the spot market has been weak. Additional research is also needed on the ease of arbitrage between exchange-traded and OTC-traded derivative products for cost effectiveness by financial and non-financial institutions.

Additional analysis is also called for to provide a separate assessment of credit, market, liquidity and funding risks inherent in the OTC derivatives markets. This would demand detailed research about the tools for measuring these risks, analysing their impact and proposing remedial solutions. Depending upon the availability of data, some statistical analysis of the sensitivity of bank performance as a function of OTC market participation may provide useful information.

The evidence on corporate use of the OTC derivatives market for hedging real and/or potential exposure is also limited. Given the increased use of international financial markets by the Indian corporate sector for trade financing, external commercial borrowing and foreign direct investment, we should encourage the use of OTC derivatives markets for hedging the potential exposure of the corporate sector. This will be an important step in the right direction.

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## Appendix I: Difference between Exchange-traded Futures and OTC-traded Forwards

Forwards	Futures
Traded in the OTC (over the counter) or Interbank market, with buyer/ seller bearing mutual counterparty risk.	Traded on Exchanges, with the Exchange bearing counterparty risk with respect to the buyer/ seller.
Can have any maturity date, customised to the requirement of the Buyer.	Has fixed maturity dates. In the case of dollar-rupee futures, the maturity dates will be the last working day of a calendar month, going out to 12 months.
Can be for any amount, customised to the requirement of the Buyer.	Lot size is fixed. Transactions can be in multiples of the fixed lot size, not in broken/ odd amounts.
The Forward Rate = Spot Rate + Forward Difference, where Forward Difference $\leq$ 0.	The Futures Rate = Spot Rate + Forward Difference, where Forward Difference $\geq$ 0
In case of USD-INR, the forward rate is quoted as X INR per 1 USD. For example, the current Forward Rate for 31-Aug-08 is 42.3350 INR per USD 1.	Some clarity is needed on this, but our understanding, so far, is that for dollar-rupee futures, the futures rate will also be quoted in the same manner as the Forward Rate.
No margin requirement	Margin required
Avowedly non-speculative for corporates in the Indian context, because trades (hedges) can be done only against and to the extent of actual exposures.	Fully speculative, because the contracts will be cash-settled on expiry. No delivery of dollars can either be taken or given.
Account for, by far, the lion's share of the market volume. Estimates range from 80-95%.	Accounts for a small part of the total market volume, with estimates ranging from 5-20%.
Client (corporate) trades/ hedges with a bank.	Client will trade/ hedge with a broker who is a member of the exchange.

Source: Kshitij Consultancy Services (2008)

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