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Features and trends of NDF markets for Emerging Economy Currencies: A study of the Indian Rupee

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1 Executive summary

Non-deliverable forwards (NDF) are markets for contracts where the underlying are movements of the currency of one country but which are settled in the currency of another. For example: the rupee NDF market is largely a USD settled market on the INR-USD rate. Such a market arises for currencies which are not readily available for trade globally – typically, currencies of countries which impose convertibility restrictions on the capital account. Participants in trade and capital flows into and from these countries face barriers in using the domestic currency derivatives markets to hedge or speculate on the movement of the local currency and the NDF market offers them alternative avenues to do so.

Today, an active and growing market for trading NDFs exists. The size of this market has an estimated daily turnover of USD 126 billion, approximately 19% of all outright forwards traded globally (BIS, 2013). NDFs in six currencies – the Korean won, the Indian rupee, the Chinese renminbi, the Brazilian real, the New Taiwan dollar and the Russian rouble – account for two-thirds of this trade. Most of this trading takes place over-the-counter (OTC) in international financial centers, such as New York, London and Singapore. As a result, for these currencies, domestic and international investment interests collect as trades in two distinct marketplaces: the domestic deliverable currency derivatives market, governed by local country regulations, and the offshore non-deliverable market, governed only by industry standards such as the International Swaps and Derivatives Association (ISDA) master agreements.

Since the NDF trades mainly on an OTC market and is subject to limited regulatory scrutiny, there little transparency about how large it is, or who participates in it. Thus, estimates of its size and market performance pose a challenge. This is unlike the exchange traded markets or the domestic OTC markets for a given currency, which tend to have requirements for central reporting or central clearing and settlement.

The presence of a large, unregulated, offshore market for the local currency trading has often been a matter of concern for the market regulators in countries that impose restrictions on such trading in their domestic markets. However, from a wider policy making perspective, trading in the NDF markets reflects the fact that supply and demand for the currency is far larger than what is observed in the onshore domestic markets. Its size represents the potential liquidity and income that domestic markets would have generated had they not imposed restrictions on participation. In this sense, these

markets are a *a measure of the cost of capital account constraints*. In addition, the domestic currency markets are not isolated from the impact of the trading that takes place in the NDF market. Research suggests that bid-offer spreads and volatility in this market has an influence on the domestic onshore currency markets.

Since information regarding the size and the growth of these markets has important policy implications for the domestic economy, in this report, we explore a framework for a higher frequency measurement of the NDF market. We use the example of the NDF market on the Indian rupee. As part of the framework, we identify various sources for information about the traded volumes of the the INR NDF market, and the frequencies at which they provide information on traded volumes.

We find that there are three sources for traded volumes on the INR NDF market: (1) *surveys* conducted by BIS and central banks, of various jurisdictions of global financial institutions that act as market makers in the NDF market, (2) data reported by *electronic trading platforms* known as swap exchange facilities and (3) data reported by *clearing platforms* in jurisdictions where NDF trades are mandated to be reported and cleared centrally by regulation. In this report, then, the size of the INR NDF market is estimated using all these sources. They include the Triennial Central Bank Survey of Foreign Exchange and Derivatives by BIS, the Foreign Exchange Joint Standing Committee (FXJSC) survey in London, swap exchange facilities (SEFS) and such as the Depository Trust and Clearing Corporation of the U.S. (or DTCC).

This effort identifies discrepancies in the data across the various sources that arise from differences in reporting and coverage. We also find that trading desk estimates tend vary from end-customer trade estimates reported by these financial institutions, with the former generally being lower than the latter. This could partly explain the variation in size of the market reported by the different sources. The turnover data from these markets are benchmarked against the size of the domestic markets for a comparison of the two channels of access to INR currency movements. The domestic sources for INR derivatives trading include the onshore exchanges, and the onshore OTC markets. Other global sources include offshore exchanges in global financial centers.

We find that the lowest available estimate for the size of the INR NDF market is USD 1-2 billion daily turnover on average. This is the liquidity that trading desks of global financial institutions can readily access at any time. As an aggregate, we expect that the total traded volumes will be higher. Most of this market is in London and Singapore, primarily because these are the

leading currency trading centers with the longest trading time overlap with the Indian markets. We validate the accuracy of these estimates through interviews with market participants. The output of these interviews aligns with our findings on size and also confirms that at present Singapore has around 60-70% of the INR NDF market share, with London following at 15-25%.

In London, the size is estimated at a daily average turnover of USD 9.7 billion in October 2014. The U.S. markets, which have the least time overlap with India, have an estimated trading volume of USD 1.8 billion in October 2014. The volumes in the market appear to be quite steady in the period of April 2013 to April 2015. This is corroborated by market participant interviews that indicate a steady availability of liquidity in the rupee NDFs.

Regardless of the source and the variation in the data, the numbers indicate that trading in rupee NDFs is a significant market. Against the estimates of the onshore currency derivatives reported by the Reserve Bank of India of USD 18 billion as the daily average in April 2013, the comparable estimate for the offshore markets range from USD 10 billion (in April 2013, FXJSC) to USD 17 billion (in April 2013, BIS).

Implications for policy

The questions that arise for the domestic policy maker from this estimation exercise are two-fold: why there such large NDF markets for their currency in global market places a concern, and what can be done in response?

There are three arguments for why the domestic policy makers should be concerned when such large traded markets arise offshore. The first is a simple revenue argument: every unit of turnover in a market earns revenues for the financial firms that participate in these markets. If the NDF volumes trade in domestic markets, domestic financial firms would earn that revenue. For instance, it is estimated that financial firms earn approximately 0.2 percent of the turnover traded on Rupee derivatives markets in India. If the estimated size of the NDF market in April is a daily average of USD 10 billion, this implies an annual revenue loss of USD 500 billion to the domestic economy. The second argument is that fragmented markets face more dispersed price discovery than a single market. If the global interest on the Indian Rupee could trade in domestic markets, this would be the dominant forum for price discovery on the Indian currency. The third argument comes from the perspective of regulatory effectiveness and is also the reason local regulators and policy makers view the NDF market suspiciously. The presence of this market has the potential of making regulatory interventions towards currency man-

agement ineffective, as was witnessed in the context of the rapid depreciation of the rupee in early 2013 and subsequent actions taken by the RBI towards currency defense.

For all these reasons, the Indian policy maker should be concerned about the presence and the growth of the NDF markets on the Indian Rupee. What can be done to counter this? The first report of the Standing Council on the competitiveness of the Indian financial system set up by the Ministry of Finance in 2013, analyses this problem and presents a set of issues that need to be addressed as a counter measure. The report identifies constraints on accessing domestic markets, which range from high capital controls to tight position limits on the exchange products, market frictions caused by onerous documentation and Know Your Customer (KYC) norms, and limited trading times on the exchanges. At present, the regulator also does not take cognisance of the NDF market in any tangible way, which further reduces transparency about this market to Indian policy makers.

Some of these issues can be fixed relatively easily. For example, market microstructure constraints can be reduced by improving position limits and increasing trading time. If foreign branches of domestic banks are permitted to participate in the NDF markets, both domestic participants and policy makers can understand better and counter these offshore markets. Other issues such as documentation friction, specially on the exchange platform, are also not hard to address.

Other constraints are more structural but can be rectified over a medium term, such as the lack of certainty about policy and regulation. Better regulatory governance can be implemented to reduce regulatory risk to all participants of the domestic markets. Indian regulators have already agreed to adopt the *Handbook on adoption of governance enhancing and non-legislative elements of the draft Indian Financial Code* (Handbook, 2013), which lays down the procedural requirements prior to regulation making. It provides an explanation of the measures to be taken, along with the rationale for implementing the measure. It contains examples of best practices from India and other advanced jurisdictions which are already implementing such measures and also provides a brief checklist of specific actions that may be taken for regulation making.

Restrictions such as capital controls require far more policy focus, thinking and planning and can only be addressed in a phased manner. However, while these such fundamental changes will take time, more short term measures are available to regulators to develop a better understanding of the NDF market. This includes allowing domestic institutions to participate in this market in

a structured manner. This will increase the depth of information available about the contours of this market and allow steps to be taken to make the domestic market competitive relative to it.

Finally, as India develops as a major global economy, policy makers need to consider establishing the steps required to develop the rupee as a global currency. For example, India could pursue the goal of internationalisation of the rupee by making significant progress towards satisfying the pre-requisites of the currency internationalisation process. These include taking steps towards developing deep and liquid capital markets, adopting monetary policies that establish a stable inflation and currency regime, allowing full capital account convertibility, and establishing a politically stable economy. All these measures are also the ones that need to be pursued for maintaining the pace of economic growth of the country.

2 Controlling the risk of emerging economy currencies

Over the last two decades, global financial flows have been increasingly reaching emerging market economies (EMEs) as investment targets. Compared to a decade ago when the allocation in the MSCI index into EMEs was below a percent, the EME portfolio today is more than 10%. If the returns of these investments are measured in terms of the global currency (typically, the US dollar), it is important for asset managers to be able to hedge the risk of this wider basket of currencies, including EME currencies.

However, policies in emerging market economies (EMEs) make it difficult for this global funds flow to hedge the volatility of EME currencies. Most EMEs have capital account restrictions on the currency, which tend to carry over to capital controls and restrictions on trading in domestic markets for currency derivatives. Most EMEs only permit hedging for transactions that directly relate to trade and foreign direct investment. Another constraint is the need for approvals to access markets. Most EMEs require formal approval processes or qualified investor schemes for foreign participants to access domestic markets. Some EMEs restrict which domestic counterparty foreign market participants can trade with in onshore currency markets (Guru, 2009). As an example, access to currency derivatives markets for the Indian rupee (INR) are typical of such constraints on foreign participants. Capital controls in the onshore INR derivatives market are high. Rules and regulations in both the domestic exchanges as well as the domestic OTC markets for INR derivatives impose severe limitations on the access by foreign participants. In India, similar constraints also fall on domestic participants of these markets.

Thus, the growing need to hedge EME currency risk is the emergence of non-deliverable forward (NDF) markets on EME currencies in the large financial centers. NDFs are outright forward (OTC) contracts, settled between counterparties in a currency of their choice and not the EME currency. Unlike deliverable forwards in domestic markets that are settled in the local currency, NDFs tend to be settled in a completely convertible currency, usually the US dollar. The settlement is the difference between the NDF rate and the prevailing spot rate at maturity on a notional amount of the EME currency. NDFs help foreign investors access payoffs related to an EME asset investment without their needing to provide, or require funding in the underlying EME currency. The NDF can be used by foreign investors with EME currency exposure to hedge EME currency risk, or as a speculative instrument to take exposure to EME asset risk in the currency of their choice (McCauley *et al.*,

2014).

Markets for NDFs tend to be concentrated in the large financial centers of the world including London, Singapore, Hong Kong, Tokyo, New York, Seoul, and Taipei (LSE, 2012). However, liquidity for a specific EME NDF tends to be highest in the financial center which has the largest time overlap with the EME market itself. For example, London and Singapore are said to be among the largest markets for INR trading.

Another development on trading EME currency derivatives in global markets are exchange traded derivatives. Given the heightened regulatory push on more transparent markets in the aftermath of the 2008 financial crisis, these financial centers have also started providing derivatives on EME currencies on exchange traded platforms. For example, there has been significant effort in both Dubai and Singapore to increase market share on trading USD-INR futures and options. However, the offshore exchange traded markets tend to be relatively small compared to the offshore NDF market. For instance, in April 2013, the average daily turnover in USD-INR futures on the Dubai Gold and Commodities Exchange (DGCX) was around USD 2 billion while the global USD-INR NDF average daily turnover was around USD 17 billion.

Thus, while there are both exchange traded and OTC products on EME currency derivatives, the NDF markets tend to be several times larger than the exchange traded products, a feature that holds true for all EME currencies.

The presence of these markets poses two problems for the EMEs. First, when offshore markets develop depth of liquidity enough to have a substantial fraction of the market share on EME currency derivatives, the local markets lose their advantage of price discovery on their own currency. This undermines the ability of EME central banks to efficiently manage domestic monetary policy. Second, the size of these offshore markets are a measure of revenue lost from transactions that would have been done on domestic markets instead, but for poor regulatory policy.

For both these reasons, it is in the interest of the EMEs to measure and monitor the size of the offshore derivatives markets on their own currency. Box 1 describes the work in an earlier report on trading of BRIC currencies in the London currency market.

Box 1. BRIC currencies trading in London, a report in 2012

The LSE (2012) report was prepared by London School of Economics and City of London Corporation to examine the trading of BRICS currencies in the London currency market. They summarise existing information and data on NDF trading in the London currency market. They also provide a qualitative outlook on the future of NDF business in the BRICS currencies by way of interviews with relevant players and highlight any risks or concerns when considering investing or trading in NDF contracts. They find that trading volumes in BRICS currencies have increased significantly since 2008 and NDFs account for a large fraction of the overall volume of currency trading in these currencies. The daily global volume for NDFs in the Brazilian real, the Indian rupee and the Chinese renminbi is more than USD 40 billion, compared to global spot transactions of USD 30 billion in 2010. For all BRICS currencies, the NDF and deliverable forward rates are almost perfectly correlated with correlation coefficients generally exceeding 99.5%. In London alone, NDF volume in BRICS currencies has increased by almost 70% between April 2008 and April 2012.

Of the two, the size of the exchange traded derivatives can be easily captured since exchanges are incentivised to capture and publish currency volumes data with transparency and regularity, including those for the EME currencies. However, this is not the case with the OTC markets. Traditionally, these markets do not have centralised trading, are not centrally cleared, and have no mandate for centralised reporting. Therefore, there is currently no ready, single source of data available to estimate the size of this market at any given point in time, let alone at a regular frequency.

The only regular mechanism for the size of the NDF markets are the surveys carried out by banking regulators for micro-prudential requirements. The best known of these is the Triennial Central Bank Survey conducted by the Bank of International Settlements (BIS) and published since 1995. The BIS survey is compiled from survey results reported by the largest banks and financial firms about the size and structure of the global currency and derivatives market. This is considered the most comprehensive source of the measure of the size of the NDF markets.

Surveys are now being used by other banking regulators, particularly in the large financial centers, to capture the exposure of their regulated entities to OTC derivatives products. While these surveys tend to focus on the larger currencies, there is some information about EME currency derivatives that is available in these. These are semi-annual surveys conducted by central bank-sponsored industry groups, called the Foreign Exchange Committees

(FXCs), that measure the OTC derivatives market turnover in their respective jurisdictions, typically in April and October each year.

Another consequence of the global regulatory push for greater systemic stability is a requirement for OTC products to be cleared through a central counterparty. The U.S. Dodd-Frank Act requires certain types of swaps and derivatives to be cleared through a central counterparty (CCP). Similar regulation is planned under the European Market Infrastructure Regulation (EMIR). This has led to a set of swap and OTC derivatives (including NDF) trades involving US residents to be reported to Depository Trust and Clearing Corporation (DTCC) starting October 2013. These are transacted on transparent, exchange like platforms called the swap exchange facilities (SEFs) that are registered with the US futures markets regulator, the Commodity Futures Trading Commission (CFTC). Since 2014, NDF trades cleared on SEFs are reported by the Futures Industry Association (FIA) on a regular basis.

Similar regulatory compulsions on clearing of OTC derivatives suggest that there will be an increasing number of such SEFs through which greater transparency about the NDF markets will evolve in the near future.

At present, a consolidated measure of the size of the EME NDF markets is difficult to compile across these various sources. This is because each of these sources vary widely in coverage (how much of the NDF market share it captures) as well as in frequency (at what intervals are the measures available). While the BIS survey has global coverage, it is conducted only once in three years. Various central bank surveys are conducted more frequently, but the coverage in these surveys is limited to the volumes in that jurisdiction. Data from global central clearing corporations such as the the DTCC and electronic trading platforms like the SEFs is available at a higher frequency (monthly). However, coverage tends to be even smaller than the central bank surveys. Thus, in order to estimate the size of the NDF market more frequently than once in three years, it is important to collect and assess information across all these data sources. These are not substitutes, but act as complements to our knowledge about the size of an NDF market.

In this report, we have compiled a dataset on the size of the exchange and OTC markets using the INR as an illustrative EME currency. Our aim is to understand linkages across multiple sources of data and how these can be used to arrive at a higher frequency estimate of the size of the NDF market than the BIS surveys. We also examine the trend in the size of currency derivatives on the USD-INR. This trend helps us understand some factors that drive the liquidity of offshore markets. This helps us develop some recommendations for the Indian policy maker on how to improve the liquidity and market share

Table 1 Summary of the data sources

Venue	Product	Coverage	Frequency
Currency: INR			
Onshore Exchanges (NSE, BSE, MCX)	Futures, Options	India	Daily
Offshore Exchanges (DGCX)	Futures	Global	Daily
Onshore OTC (RBI, BIS)	Spot, DFs, Swaps, Options	India	Weekly, Triennial
Offshore OTC (BIS, FXJSC, SEFs, DTCC)	NDFs	Global, London Global, Global	Triennial, Semi-annual, Monthly, Daily

DFs: deliverable forwards, NDFs: non-deliverable forwards

of onshore currency derivatives markets.

3 Tracking derivatives trading on the Indian Rupee

Indian rupee linked products are traded in four venues across the world: *exchanges*, both in the local jurisdiction (called onshore markets) as well as in international jurisdictions (called offshore markets) and *Over-The-Counter* (OTC), both onshore and offshore. The first two offer the highest level of transparency about the size and depth of the markets for these products. The onshore OTC market is regulated by the Reserve Bank of India (RBI) which regularly reports the size of the onshore OTC transactions on INR hedging. The offshore (NDF) markets are the least transparent, and the size of these markets need to be compiled from multiple sources, as outlined below.

3.1 Exchanges, onshore

Currency derivatives started trading on Indian exchanges from 2008. There are three exchanges to trade currency derivatives in India. They are: National Stock Exchange (NSE), Bombay Stock Exchange (BSE), and Multi Commodity Exchange (MCX). While both futures and options are traded

on NSE and BSE[1], only futures is traded on MCX. From each exchange, we gather data available on daily traded volumes for the USD/INR futures and options contracts. The volumes data is reported in the bhavcopy available publicly on the website of the exchanges.

3.2 Exchanges, offshore

Offshore exchanges that trade futures on USD-INR include Chicago Mercantile Exchange (CME), DGCX, and Singapore Exchange (SGX). While data is available from all three exchanges, trades from the CME and SGX are relatively sparse. So, we have restricted ourselves to collecting data available on daily traded volumes for USD-INR futures on DGCX, extracted from the end of day volumes report available at the exchange website.

3.3 Over-the-counter markets, onshore

In these domestic markets, derivatives on the currency such as swaps or forwards are traded, where the counterparty has to be a bank or financial institution that is registered as an Authorised Dealer Category I, or AD I bank. The size of this market is captured by these AD I banks reporting their trades to the Reserve Bank of India (RBI).

Aggregate turnover data is published by the RBI in the Weekly Statistical Supplement (WSS).[2] The data is divided by currency pairs (foreign currency (FCY)/INR or INR/FCY), by transaction (merchant or inter-bank) and type (spot, swaps or forwards). Using this data, volumes on total spot, swaps and forwards is calculated as follows: Spot and swaps are the sum of sales and purchases of FCY/INR spot and swaps, for both merchant and inter-bank transactions. Forwards are defined as sum of sales and purchases, less cancellation of FCY/INR contracts. This is done for both merchant and inter-bank transactions.

[1]Prior to 2014, currency derivatives were traded on United Stock Exchange (USE) which was acquired by BSE in 2014.

[2]The latest WSS is for the period June 2015 and is available at https://rbi.org.in/scripts/BS_ForeignExchangeDisplay.aspx?prid=34239

3.4 Over-the-counter markets, offshore

In the global marketplace, there are no such restrictions on who can be the counterparty to an NDF trade since settlement takes place in a global currency. The consequence is that there are no central repositories where information about NDF currency trades are reliably or comprehensively collected or accessed.

Data for the OTC offshore derivatives markets has come from surveys. Typically these are conducted by the banking regulator in a particular jurisdiction on their regulated firms.

The Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity is published by BIS, and is the only source that attempts a comprehensive coverage of the markets in the survey. The 2013 survey collates data from 53 jurisdictions, and around 1300 banks and dealers.

This survey presents detailed information regarding the global currency OTC derivatives markets. It reports turnover in spot, outright forward, FX swap, currency swap and FX option transactions in 40 different currencies. Moreover, the data is broken down by several categories, including type of counterparty, execution method, trading relationship and maturity, where the basis for reporting is the location of the sales desk.[3]

In addition, typically, central bank-sponsored foreign exchange committees (FXCs) conduct semiannual surveys in their respective jurisdictions. These surveys seek to capture turnover volumes in their markets in April and October each year. At present, the largest committees for the NDF on the Indian Rupee includes: the Foreign Exchange Joint Standing Committee (FXJSC) in London, the Foreign Exchange Committee (FXC) in New York, the Singapore Foreign Exchange Market Committee (SFEMC) the Tokyo Foreign Exchange Market Committee (TFEMC), the Australian Foreign Exchange Committee (AFXC) and the Canadian Foreign Exchange Committee (CFEC). The basis for reporting is the location of the price-setting dealer.

[3]The currency volumes are reported on a gross-gross, net-gross, and net-net basis. The gross-gross estimates are not adjusted for local or cross-border double counting. The net-gross estimates are adjusted for local double counting. The net-net estimates are adjusted for local and cross-border double counting in the inter-dealer trades. For example, the currency turnover in India for April 2013 was at USD 43.8 billion on a gross-gross basis, USD 31.2 billion on a net-gross basis, and USD 28.2 billion on a net-net basis.

Table 2 Total volume by SEF, January 2015

		In billions notional USD		
SEF	Products	NDF	Options	Total
BGC	NDF, currency options	94.89	104.03	198.92
Tullet Prebon	NDF, currency options	80.78	46.20	126.98
GFI	NDF, currency options	68.29	67.19	135.48
Traditon	NDF, currency options	33.57	97.93	131.49
ICAP	Currency forwards, currency spot, NDF, currency options	124.18	-	-
TR	NDF, currency options	12.94	0.93	13.87
Bloomberg	NDF, currency options	7.86	2.11	9.97

3.5 Swap Exchange Facilities, SEFs

There are several SEFS for trading NDF and options (Table 2). These include: ICAP, Tullet Prebon, GFI, Tradition, Bloomberg, Thomson Reuters (TR).

Similarly, FIA compiles traded volumes from registered swap exchange facilities, and volumes reported to the US Depository Trust and Clearing Corporation, DTCC. In 2014, FIA began collecting volume data from these SEFs, a new type of trading venue registered with the Commodity Futures Trading Commission. FIA publishes reports on volume trends across the SEFs on a regular basis. FIA's SEF Tracker includes volume data for interest rate, credit and foreign exchange products traded on SEFs.

3.6 Depository Trust and Clearing Corporation, DTCC

The US Commodity Futures Trading Commission requires all NDF trades involving a US resident to be reported to DTCC, a post-trade financial services company providing clearing and settlement services to the financial market. This data is captured by Thomson Reuters Eikon.

3.7 Polling market participants

Large financial institutions estimate the size of the USD-INR NDF market at USD 1-2 billion per day. They estimate the size as the depth of the market, however, the average daily turnover in this market may be much higher.

Table 3 Average daily turnover for USD-INR onshore exchanges, April 2013

In USD Billion

Onshore				Offshore	
	Futures	Options	Total		Futures
NSE	2.3	1.1	3.4	DGCX	2.1
USE/BSE	0.1	-	0.1	SGX	-
MCX	2.2	-	2.2	CME	-
Total	4.6	1.1	5.7	Total	2.1

*Blank field indicates product is not traded or data not available.

Sources: NSE, USE, MCX-SX, DGCX

4 Sizing the INR-USD NDF market

Given the varied sources of venues where the INR is traded, we now create a framework to measure the size of the derivatives market on the Indian Rupee. Of the various currencies available for trade against the INR, the largest market share is in the USD-INR linked products. This has 89-90% of the total traded volume, summed across the exchange and OTC markets. The INR does trade against other currencies such as the EUR and the JPY. In this section, we focus on only the USD-INR.

Traded volumes in the exchange markets

The average daily turnover for USD-INR derivatives for April 2013 on onshore exchanges was USD 5.7 billion and on offshore exchanges was USD 2.1 billion. The daily average turnovers across exchanges are presented in Table 3.

Traded volumes in the OTC markets

From the Triennial Central Bank Survey, we observe the global currency turnover on the OTC market for various emerging market economies. Table 4 reports the average daily turnover for Brazilian real (BRL), Russian ruble (RUB), Indian rupee (INR), Chinese renminbi (CNY), and Korean won (KRW) for April 2013. This shows that the CNY was the most actively traded currency in the global OTC market while KRW had the most actively traded NDFs. While the total global INR trading is lowest amongst the EMEs, the INRNDF is the second most traded NDF.

Table 4 Global OTC currency turnover by currency and instrument, April 2013

In USD Billion

Currency	Spot	Forwards (o/w NDF*)	Swaps	Options	Total
BRL	11	34 (16)	4	11	60
RUB	37	9 (4)	37	3	85
INR	15	24 (17)	10	3	53
CNY	34	28 (17)	41	17	120
KRW	19	24 (20)	17	4	64

BRL=Brazilain real, RUB=Russian rubble, INR=Indian rupee, CNY=Chinese renminbi, KRW=Korean won

*NDF volumes only available against USD.

Source: Tables T.02.01 - T.02.12, BIS Triennial Survey, 2013. Reported on net-net basis i.e. adjusted for local and cross border inter-bank dealer double counting.

4.1 Validation

Since the OTC market size is compiled from various sources, each with different coverage and frequency, each source only provides an estimate of the size of this market. In order to evaluate the accuracy of the estimates, it is important to create a reference framework within each of these.

As an example, we create a framework by compiling and comparing the market size estimates for USD-INR OTC trading for April, 2013. Since we have estimates from various sources for this particular period, it allows us to compare the variation in size estimates from different sources directly.

For instance, the size of the *onshore* OTC data for April 2013 is surveyed and published in the BIS Triennial Central Bank Survey. There is also an estimate for this available in the Weekly Statistical Supplement of the RBI for that period. Both these estimates ought to be directly comparable. If the measure for the onshore market size are the same from the two sources, it strengthens the validity of the size of the *offshore* market reported in the BIS survey. On the other hand, if there is a wide gap, that would suggest that the NDF market size reported in the BIS must be treated with some caution.

Comparing the size of onshore OTC, RBI vs. BIS

A comparison of the onshore INR OTC numbers across the two sources is presented in Table 5.

Table 5 shows a significant gap between the RBI and BIS estimates for the size of the onshore USD-INR OTC market in April 2013. The RBI

Table 5 Estimates of average daily turnover for onshore USD-INR OTC market, April 2013

		In USD Billion
Reporting	Source	INR
Net-gross	RBI[a]	41.3
Net-gross	BIS[b]	25.6
		(25.1)

Source: [a]Includes spot, forwards, swaps for all currencies against INR, Weekly Statistical Supplement, RBI

Source: [b]Includes spot, outright forwards, swaps, options, and other products for all currencies against INR (USD against INR), Table T.06.02 (T.07.02), Triennial Central Bank Survey, 2013.

estimates are nearly 60 percent larger than the BIS estimates. Kumar *et al.* (2015) believe the actual onshore figure to be in the region of approximately USD 40-45 billion per day.

Estimates for the size of the offshore OTC market for USD-INR, April 2013

The size of the USD-INR market (deliverable and non-deliverable contracts) across jurisdictions is available from the BIS Triennial survey. This information identifies Singapore, United Kingdom (UK), United States, and Hong Kong as the primary centers of USD-INR trading offshore. The average daily turnover across these jurisdictions is reported to be USD 31.7 billion in Table 6.

Conversations with market participants suggest that while all large international markets and financial centers are likely to trade the USD-INR NDF contract, the trading volumes tend to be concentrated in those centers with the highest trading time overlap with the Indian market.

This helps to explain two features of the INR NDF market: (1) Singapore is the largest market trading USD-INR offshore. This is consistent with the market perception about the importance of the trading time overlap between the two jurisdictions. Singapore starts trading before the Indian markets, and continues trading after their close. In contrast, the London markets trading overlaps only in the second half of the Indian market hours. (2) The FXJSC estimate of the USD-INR offshore market is higher than the BIS estimate.

Table 6 Average daily turnover for all USD-INR products by country, April 2013

In USD Billion

Country	BIS[a]	FXJSC[b]
Singapore	15.9	-
United Kingdom	7.2	14.3
United States	5.2	-
Hong Kong SAR	3.4	-
Others	1.6	-

Includes spot, outright forwards, swaps, and options.

Source: [a]Reported as net-gross for USD against INR, Table T.07.02, Triennial Central Bank Survey, 2013.

Source: [b]Reported for USD against INR, adjusted for double counting of deals between survey contributors, FXJSC survey, 2013.

Table 7 Average daily turnover for USD-INR NDF, BIS vs. FXJSC, April 2013

In USD Billion

Global	USD-INR
BIS: Net-net[a]	17.2
FXJSC: London[c]	10.4

Source: [a]Table T.03.02, Triennial Central Bank Survey, 2013

Source: [c]FXJSC survey, 2013

Estimates for the size of the offshore NDF OTC market for USD-INR, April 2013

Table 7 reports the NDF USD-INR size estimates for the global market from the BIS survey and the NDF USD-INR estimates for the UK jurisdiction from the FXJSC survey in the common period of April 2013. However, this seems to suggest that London is the primary center for trading USD-INR NDF while conversations with market participants as noted earlier seem to suggest that Singapore is the primary center.

Summary of trends in NDF market size across different sources

Figure 1 plots the USD-INR NDF volumes from the Triennial Central Bank Survey, the FXJSC survey, the SEFs, and DTCC for April 2013 to July 2015. The graph shows that the numbers can vary significantly across sources, because the coverage is different across these sources. The discussion in the previous sections suggest that the USD-INR NDF

Figure 1 USD-INR NDF average daily volumes in USD billion, 2013 to 2015

The graph below captures the USD-INR average daily NDF volumes from the Triennial Central Bank Survey, the FXJSC survey, and the SEFs for April 2013 - April 2015. The Triennial Survey captures the global volumes, the FXJSC survey captures the London volumes, the SEFs capture trades only cleared on their platform, and DTCC captures trades involving US residents. Since reporting to DTCC and transacting on SEFs are a CFTC requirement, their volumes may reflect volumes for the North American jurisdiction with DTCC volumes being more comprehensive in coverage than the SEFs.

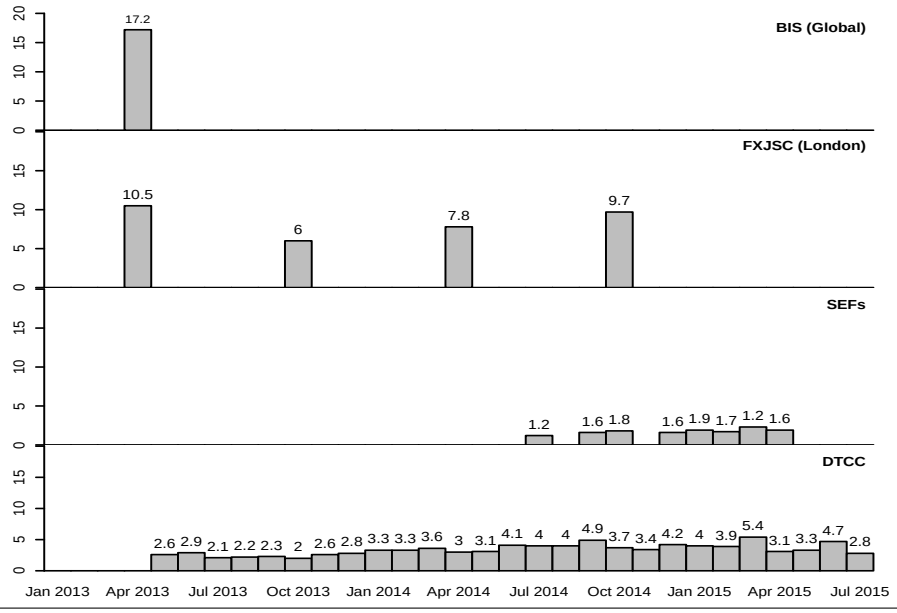

Table 8 Domestic derivatives vs NDF

	Average Daily Volumes (in USD Billion)[1]							
	Q2-13	Q3-13	Q4-13	Q1-14	Q2-14	Q3-14	Q4-14	Q1-15
Exchanges								
India	5.77	3.36	1.74	2.12	2.45	2.79	2.45	2.87
Intl.	2.48	1.89	1.12	1.38	1.20	1.35	1.31	1.51
OTC								
India	17.73	15.35	15.48	18.43	20.83	18.44	17.93	17.82
Intl. (BIS)	17.20	-	-	-	-	-	-	-
Intl. (FXJSC)	10.47	-	6.01	-	7.83	-	9.69	-
Intl. (SEFs)	-	-	-	-	-	1.41	1.72	1.95
Intl. (DTCC)	1.84	2.17	2.46	3.39	3.43	4.30	3.77	4.41

Q4-14 denotes October-December, 2014; Q1-15 denotes January-March, 2015.

[1]Exchanges: Traded volumes for India are summed for USD-INR futures across NSE, BSE and MCX-SX. BSE data are available only from Q1 2014. Only DGCX data on USD-INR futures are used for international traded volumes.
OTC: Traded volumes in onshore OTC markets are calculated using INR outright forwards and swaps data from the RBI Weekly Statistical Supplement. INR NDF volumes are used for offshore traded volumes. The monthly NDF volumes are used as estimates for the quarter. The NDF volumes are captured from the Triennial Central Bank Survey, the FXJSC survey, the SEFs, and DTCC. The numbers vary significantly across the sources since they vary in coverage. The Triennial Survey captures the global volumes, the FXJSC survey captures the London volumes, the SEFs capture trades only cleared on their platform hence would account for only a fraction of the total volumes, and DTCC captures trades involving US residents and once again captures only a fraction of the total volumes.

market share from the North American region is likely to be the smallest since this location has the least overlap in trading times with the Indian markets. Thus, it is not surprising that these estimates are low. However, this also suggests that, with the lack of the comprehensive BIS estimate for a given period, one high frequency estimate of the size of the USD-INR NDF market could be the sum of the NDF size from London and the SEFs/DTCC.

4.2 Features and trends

McCauley *et al.* (2014) describe two paths for evolution of the NDF markets. If non-residents were able to access the onshore market freely, then the NDF markets would become redundant. For example, after the emergence of the offshore renminbi market, renminbi volumes in London are more deliverables. If there are restrictions then NDF markets continue to grow. The USD-INR NDF market falls under the latter: the market continues to attract foreign investors who wish to take positions in the local currency and face severe restrictions in the domestic markets.

Table 9 FX exposure in India, 2013-2014

In USD Billion

Trade flows		Foreign investment	
Export	314	FII	11.5
Import	450	FDI	16.1

FII: foreign institutional investors; FDI: foreign direct investment

Source: Ministry of Commerce, RBI

However, this was not always the case. An examination of the trend in the market over a longer time horizon shows that the domestic markets were growing towards a larger market share. Table 8 reports the average daily volumes for domestic derivatives and NDF markets for INR. Onshore exchanges were competitive on market size from April 2013 to June 2013. After this quarter, the volumes dropped significantly. One cause of this are the severe regulatory measures taken in July 2013 by first the RBI and then the Securities Exchanges Board of India (SEBI).

Tayal (2013) examines the effect of these interventions on a broader set of market quality measures including transactions costs (measured by impact cost), open interest, volatility and the level of the currency. The analysis concludes that the interventions did not achieve the stated intent, and also had the affect of adversely impacting the quality of the exchange traded derivatives markets in all dimensions. Even two years after the intervention was implemented (and a partial reversal was attempted in June 2014), the market quality of the exchange traded currency derivatives market remains adversely impacted.

In contrast, the onshore OTC markets appeared to have recovered the market size of the pre-intervention period. Further, anecdotal evidence from conversations with market participants and the survey numbers suggest that there has been a similar growth in the offshore NDF market as well.

5 Policy implications

The evidence of the previous sections clearly point to a large and rapidly growing market for emerging market currencies. In the case of the Indian Rupee, this is not surprising given the combination of increased foreign in-

vestment interest and increased volatility in the currency over the last decade (Table 9). Presently, these investors are permitted are allowed to hedge Rupee risk in domestic markets in a restricted manner. However, unlike domestic investors who are constrained to mostly trade in domestic markets, foreign investors can hedge their risk using the offshore (NDF) market. The measurement in the previous sections provide evidence that the interest from global investors in hedging INR risk is being increasingly met by global financial markets. Further, the larger fraction of the market uses the more non-transparent and difficult to measure NDF market.

5.1 Domestic factors driving trading offshore

What drives these investors away from using the domestic markets are a series of restrictions on access imposed, through multiple instruments, by the domestic policy maker. We list the main restrictions as highlighted in Volume I of the report of the Standing Council (Standing Council on International Competitiveness of the Indian Financial System, 2015) on access below:

1. **Capital controls** Capital controls are rules of permission imposed by a country on use of its domestic markets, typically defined by law or regulation. In many EMEs, these are a key factor inhibiting the growth of domestic currency derivatives markets. India is a good example of this.

   Currency derivatives were introduced on Indian exchanges in 2008. Foreign investors were not allowed to participate in this segment until June 2014. The permission to participate is restricted by documentation requirements (RBI Circular: June, 2014): Foreign portfolio investors (FPIs), registered with SEBI, are allowed to hedge only to the extent of their demonstrable exposure in Indian debt and equities. On the OTC segment, foreign investors can only come through few custodian banks that dominate the market, making it less competitive. The RBI exercises strict regulatory controls for permitted participants. Further, these markets trade limited products (only forwards and swaps).

2. **Position limits**

   FPIs can take derivatives positions to a limit of USD 15 million. In the onshore OTC markets, they can take positions up to their underlying exposure to foreign currency through trade or investments. There are restrictions, both on the type of products they can use, and on how they can modify their exposures.

3. **Frictions**

There are frictions at multiple levels in domestic markets which raise the tangible and intangible costs of trading here. For example, FPIs are required to go through registration norms and onerous Know Your Customer (KYC) norms. These are different when trading on the exchange and taking positions in the OTC market. Supporting documentation is required to take positions: from taking forward positions in the OTC market, or modifying the extent of their exposure. Since exposure can change frequently either because of business flows or changes in the currency itself, the documentation at every position and for every change can be extensive.

4. **Regulatory risk**

   Frequent and significant changes take place in regulations and guidelines in the domestic exchange and OTC markets, translating into high degree of regulatory risk to participants. The largest episode of this nature involved a series of interventions in July 2013 to defend the currency (Tayal, 2013). These interventions had a large and negative impact on market quality, as well as helped drive market share to the offshore markets.

5. **Short market trading hours**

   The onshore markets operate from 9 a.m. to 5 p.m. Indian Standard Time (IST) making it shortest trading market compared to all the alternative venues trading INR currency derivatives. This allows price discovery on the INR to shift to locations such as Dubai and Singapore.

In contrast, offshore markets – either the exchanges or the OTC markets – impose no restrictions on participation other than through instruments of risk management, and offer certainty of legal, tax and regulatory environment within which to trade. Thus, it is not surprising that foreign investors, who are able to access the offshore markets, prefer to trade in the INR NDF markets instead of the domestic ones.

5.2 Corrective policy responses

Each of the issues raised above can be used by the domestic policy to correct the imbalance in the growth of offshore markets at the cost of the domestic ones.

Some of these could be fixed relatively quickly. These include improving the microstructure of domestic markets. If position limits are raised, trading times increased, and domestic financial institutions to participate more freely in the NDF market, there can be a reversal of the volumes from the NDF to the domestic markets.

Some of the issues are more structural – such as better regulatory governance – but which can be done over the medium term. For example, regulators have agreed to adopt Handbook guidelines that are the non-legislative changes to regulatory governance proposed in the Indian Financial Code. Till structural issues such as capital account convertibility are fixed, structured participation by domestic institutions in NDF markets ought to be allowed by the regulator. This will increase knowledge about these global markets, which in turn helps policy to more effectively respond to it.

While capital controls highlight the inaccessibility of the onshore market to foreign investor, a deeper problem is posed by the partial capital account convertibility of the Rupee which restricts the use of the currency outside the country. This problem has been partially tackled by China which continues to impose capital controls but has taken steps to internationalise the renminbi to allow the use of its currency outside the country, as described below.

5.3 Currency internationalisation with controls: the renminbi

According to McCauley (2011), a currency is internationalised when market participants – residents and non-residents alike – conveniently use it to trade, to invest, to borrow and to invoice in it outside the currency's home country ("offshore"). China quickened the process of internationalisation of its currency after the 2008 financial crisis when the US dollar started exhibiting weakness in the international financial market. Since China has significant foreign exchange reserves, primarily in US Treasury securities, it faces significant risk and hence has taken various measures to internationalise the renminbi.

The internationalisation of the renminbi allows increased use of the currency in China's cross-border transactions and in overseas transactions. In particular, it increases the volume of renminbi-denominated assets held by non-residents. It also refers to expanding the role of the renminbi in the international monetary system and increases the weight of the renminbi in current account transactions, capital account transactions, and foreign reserve holdings (Ranjan and Prakash, 2010).

The process of internationalisation of renminbi entails eventual full convertibility of the renminbi, liberalization of domestic financial system, more flexible renminbi exchange rate, strengthening China's financial system, development of domestic money market, opening up of the bond and equity markets,

setting up of an advanced settlement system, making necessary adjustment to the legal system, etc (Ranjan and Prakash, 2010). In lieu of completion of this process and as an effort to build the regional financial architecture, the renminbi was allowed to be used as a vehicle currency via the bilateral swap arrangements (BSAs) and as a denominating currency in the issuance of Asian bonds. Renminbi bonds or "Dim sum" bonds were issued in Hong Kong to promote a renminbi bond market outside the Chinese mainland. This hastened the process of opening of the Chinese mainland's capital market and capital account convertibility. It is also being used as the settlement currency with neighbouring countries including Vietnam, Mongolia, Cambodia. To internationalise the renminbi, the People's Bank of China (PBOC) has taken another step forward and introduced within China (Shanghai), a Pilot Free Trade Zone (the "Zone"). Restrictions on certain cross-border RMB transactions originating from the Zone are relaxed. On the equity side, the Shanghai Hong Kong Stock Connect also referred to as the *Through Train* has been introduced as a pilot project. This is another step forward in China's cross-border investment strategy. It allows investors in Hong Kong and Shanghai to directly buy shares in each other's markets. On one hand, Hong Kong and international investors can use this to access Chinese A-shares via Hong Kong, which are denominated in renminbi. On the other hand, mainland investors can gain access to equities listed on the Stock Exchange of Hong Kong (SEHK). This is a very important step towards opening of China's capital markets.

There are several advantages to internationalisation of renminbi for China. They include: reduction in exchange rate risk faced by economic agents, allowance of both the public and private sectors to issue debt in domestic currency internationally, thereby improving risk management of cross-border transactions and reduced liquidity and exchange rate risks faced by domestic firms (Maziad and Kang, 2012).

Due to the internationalisation of the renminbi, a second spot exchange rate for the renminbi (CNH) for delivery of renminbi against dollars outside the mainland (largely in Hong Kong) has emerged. In late 2010, the CNH forward was introduced and now three forward rates exist for renminbi. They are: CNY forwards traded onshore, the CNH forwards, and the CNY NDF. After the introduction of the CNH forwards, the gap between the onshore forward rate and the NDF rates narrowed from an average absolute of 1% to 0.6% (McCauley, 2011).

5.4 A case for rupee internationalisation

The advantages highlighted by the internationalisation of the renminbi makes an important case for rupee internationalisation. In addition, there are several attributes of the Indian economy that support promoting internationalisation of the rupee. For instance, India is one of the fast growing economies in the world and the seventh largest economy with a 3% contribution to the global GDP. Trade forms a large part of the Indian GDP with exports at 23.6% of GDP and imports at 25.9% of GDP.[4] India holds significant foreign exchange reserves in the region and the Indian rupee is market determined and not pegged to any other currency.

Even though the rupee's share in the global currency market is small (1% of the total global FX volume), the continuous growth in the size of the INR NDF market highlights the increasing demand for Indian currency offshore. The development of the offshore market and internationalisation of the INR should take place in parallel to establish the Indian rupee as a global currency and reduce risks due to exchange rate fluctuations, faced by all investors with an exposure to Indian assets.

Where does India stand currently?

At present, except for size, India does not fully satisfy any of the other prerequisites for currency internationalisation such as deep and liquid capital markets, stability in currency, capital account liberalisation, and political stability. Also, India's contribution to trade and the overall share of rupee in the global foreign exchange market is small.

Most of the economic laws in the country were established when India was a large controlled economy. For instance, the RBI Act was enacted at a time when few understood monetary policy framework and the Banking Regulation Act was enacted pre-nationalisation. Any talk in the process of internationalisation of rupee must factor in these considerations.

One of the most important pre-conditions for currency internationalisation is liberalisation of current and capital accounts. Current account rules impact the way Indian residents trade with the rest of the world. There are significant restrictions imposed under FEMA on current account transactions. For example, payments of exports and imports cannot be in rupees, current account transactions exceeding a certain amount require RBI approval, rupee accounts cannot be held abroad etc.

[4] IMF Economic Outlook April 2015

Some recent positive developments have been made to promote capital account convertibility. For example: offshore issuance of rupee-denominated bonds; under foreign-currency denominated borrowing (ECB), expanding the list of eligible lenders to include funds and liberalising long-term ECBs; and the Depository Receipts Scheme. The main argument against full capital account convertibility is that free flow of capital in and out of the country poses a significant threat to its financial stability. For example, in 1983, when Australia removed capital controls, there was a surge in capital outflows. But, within a relatively short period of time, capital inflows increased even more. On balance, foreign investors were attracted by the changes to the economy that followed the liberalisation of exchange arrangements.

In India, bulk of international trade continues to be denominated in US dollar. Invoicing in Indian rupee has not been very successful since the ability for trade-counterparty to hedge their risk in international markets is very limited. While China has signed six Bilateral Swap Agreements (BSA) with other emerging market economies where the renminbi is used as the vehicle currency, India has signed one with Japan in 2008 but with the use of US dollar for the swap transactions (Ranjan and Prakash, 2010).

Unlike China, which runs a large current account surplus, India generally runs a significant trade and current account deficit. But if India is to compete with China on attractive foreign investment, and to play a dominant role in the price discovery of the rupee in the global marketplace, it is important that India moves towards satisfying the pre-requisites which may eventually establish the rupee as a global currency.

5.5 Summary and conclusion

This report highlights the main findings about the size of the INR NDF market and its implication for policy.

Findings about the size of the NDF market

The lowest available estimate for the size of the INR NDF market is USD 1-2 billion daily average liquidity. This is the liquidity that trading desks of global financial institutions can readily access at any time. As an aggregate, the total traded volumes will be higher. Most of this market is available for trade in London and Singapore, primarily because they have the largest trading time overlap with the Indian markets and are leading FX trading hubs. Conversations with market participants indicate that at present Singapore

has around 60-70% of the INR NDF market share, with London following at 15-25%.

The size of the NDF market varies when we look at trading desk estimates which are likely to reflect the trades of both customers of the financial institutions as well as their trading desks. In London, these are estimated at a daily average turnover of USD 9.7 billion in October 2014. Even the market with the lowest trading time overlap which are the US markets has an estimate of USD 1.8 billion in October 2014. The volumes in the market appear to be quite steady in the period of our analysis, which goes from April 2013 to April 2015. This is unlike what we noted from conversations with market participants about the Brazilian Real where there are significant fluctuations in liquidity – it is very high at some times, and non-existent at others.

Regardless of which source, the numbers indicate that the INR NDF is a significant market. Against the estimates of the onshore currency derivatives reported by the Reserve Bank of India of USD 18 billion in April 2013, the comparable estimate for the offshore markets range from USD 10 billion (in April 2013, FXJSC) to USD 17 billion (in April 2013, BIS). This is a large offshore market in comparison with the benchmark onshore market.

Implications for policy

A question for policy makers in India to consider is why there is such a large market for hedging the USD-INR offshore given that India has both exchange and OTC markets with dominant liquidity over their offshore competitors. Partly, this may be explained by the constraints on accessing domestic markets. These constraints range from high capital controls to tight position limits on the exchange products, market frictions caused by onerous documentation and Know Your Customer (KYC) norms, and limited trading times on the exchanges. At present, the regulator also does not take cognisance of the NDF market, which further reduces transparency about this market to Indian policy makers.

Some of these constraints could be fixed relatively quickly. For example, the microstructure constraints could be reduced by improving position limits and increasing trading time. Domestic banks could be permitted to participate in the NDF markets, so that both domestic participants and policy makers can understand what drives these offshore markets.

Other constraints are more structural but could be done over the short-medium term. One such constraint is the lack of certainty about policy and regulation. Better regulatory governance is required in order to reduce regulatory risk to all participants of the domestic markets. With reference to

this, regulators have already agreed to adopt Handbook guidelines that are the non-legislative changes to regulatory governance proposed in the Indian Financial Code.

Finally, restrictions such as capital controls will require a lot more policy work to be done. Till structural issues such as capital account convertibility are fixed, participation by domestic institutions should be allowed by the regulator in a structured manner. This will increase the depth of information available about the contours of this market and allow steps to be taken to make the domestic market competitive with it.

Given the significant interest in Indian rupee offshore, India should also start thinking about establishing the rupee as a global currency. However, India should pursue the goal of internationalisation of rupee by making significant progress towards satisfying the pre-requisites of the currency internationalisation process such as develop a deep and liquid capital market, pursue monetary policies that establish a stable currency regime, allow full capital account convertibility, and establish politically stable country. This may eventually establish INR as a global currency.

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