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    REVIEW OF LITERATURE

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    STATEMENT OF THE PROBLEM

    OBJECTIVES

    HYPOTHESES

    RESEARCH METHODOLOGY

    RESULTS & DISCUSSION

    FINDINGS

    RECOMMENDATIONS/SUGGESTIONS

    CONCLUSIONS

    SCOPE FOR FURTHER RESEARCH

    ACKNOWLEDGMENTS

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    APPENDIX/ANNEXURE

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ANALYSIS OF INTER-LINKAGES BETWEEN OFFSHORE NDF RUPEE MARKET AND ONSHORE RUPEE MARKETS: A REVIEW OF LITERATURE

SANCHITA DHINGRA
RESEARCH SCHOLAR, DEPARTMENT OF COMMERCE, DELHI SCHOOL OF ECONOMICS, UNIVERSITY OF DELHI, DELHI; &
ASST. PROFESSOR
SRI GURU TEGH BAHADUR KHALSA COLLEGE
UNIVERSITY OF DELHI
DELHI

ABSTRACT

Non-Deliverable Forwards or NDFs are over-the-counter (OTC) derivative instruments for trading in non-convertible currencies such as the rupee, Malaysian ringgit, Philippines peso and the Korean won. An NDF market for a particular currency generally grows when the onshore forward market is either under-developed or its access for market participants is restricted, like it happened for Indian rupee. Trading in the offshore NDF rupee market influences the onshore spot and domestic forward markets. It has become very important to study the influence of the NDF rupee market on domestic rupee markets because the size of NDF rupee market has grown substantially and it is suspected that speculation in overseas markets is actually influencing domestic rates. Thus, monitoring the level of activity in NDF markets by monetary regulators in India has become inevitable. This paper presents an analysis of inter-linkages between offshore NDF rupee market and onshore rupee markets.

JEL CLASSIFICATION
F31, G15, G18

KEYWORDS
Hedging, mean spillovers, non-deliverable forwards, NDFs and volatility spillovers.

INTRODUCTION

Non-deliverable forwards (NDFs) are contracts for the difference between an agreed exchange rate known as NDF rate or contract rate and the actual spot rate at maturity. The spot rate at maturity is taken as the officially announced domestic rate or a market-determined rate. The contract is settled with a single payment in the settlement currency. NDFs principally trade in the offshore centers i.e. outside the borders of the currency's home jurisdiction. This enables investors to avoid restrictions on trading in the onshore centers i.e. home market and does not require them to deliver the home currency offshore.

The single most important factor driving financial markets is information. Information flows between onshore spot and forward markets; and offshore markets can affect price movements in these markets. Various attempts have been made in the last decade to examine the causal links between spot, forward and NDF markets. The nature of the NDF market in terms of its size, depth and other aspects have changed a lot over these years and so were the results of the various studies done to explore the interlinkages between offshore and onshore markets. There have been various studies undertaken by the RBI as well to explore these interlinkages after it realized the importance of the influence exercised by the highly volatile NDF rupee market on the onshore markets. This paper presents a literature review of the various studies done on this issue to explain these interlinkages and also examines the changing nature of the influence of offshore and onshore segments on each other.

A basic concept of finance is that an asset trading in two different markets should sell at the same price at each point in time. However this happens only in perfect markets, where currency forward and spot prices simultaneously reflects the same aggregate information and price discrepancies are instantly arbitraged away. In various economies, various market hostilities and investment restrictions affect the relation between the offshore NDF and domestic currency markets.

REVIEW OF LITERATURE

One of the earliest attempts to explore interlinkages between offshore NDF markets and onshore spot markets was made by Park in 2001. He investigated the interrelationship and information flows between the spot and offshore NDF markets for Korean currency. The Korean won NDF market has been the largest, deepest and most liquid NDF market in Asia as well as globally (Ma, Ho, & McCauley, 2004). Korean currency market experienced substantial changes in its exchange rate system towards the end of 1997. When the contagion of the Asian currency crisis finally reached Korea in October 1997, leading to the IMF bailout of the Korean Economy, the Korean government made the transition from managed-float to free-float system of exchange rate determination. The government removed the boundaries on daily movement of the Won–Dollar exchange rate and the bounds on foreign capital movements. Park examined the impact of these reforms in the Korean exchange rate systems on the information flows and interlinkages between the Korean Won–Dollar spot and its offshore NDF markets.

METHODOLOGY

The methods used in his research includes a unit root test for checking the stationarity of the data, a cointegration test for examining the long-term equilibrium relation between the NDF and spot rates, an error correction model for testing causality and ARCH and GARCH models for explaining time varying volatility in time series data.

Data & Sample Period: He took data of daily closing rates of the Won–Dollar NDF and spot from 1 August 1996 to 18 October 1999. He employed One-month forward contracts for NDF data and used the average of closing bid and offered rates. He divided the sample period into two separate periods surrounding the reform: Pre-reform (1 August 1996 to 09 November 1997) and post-reform (20 January 1998 to 18 October 1999). He excluded the period from 10 November 1997 to 19 January 1998 from the sample because the data in this time interval appeared to be extraordinary[1].

Findings: Park found that there were information flows between the two markets and that the reforms changed the direction of the dynamic relation between two markets.

There was a positive mean return (measured by rate change) in the pre-reform period and a negative mean return in the post-reform period. When he compared the market volatilities, he found that the volatility of spot rate changes was only half of the NDF volatility in the pre-reform period whereas the difference reduced in the post-reform period. There was distortion of the domestic spot rates prior to the reforms, but the regulations and controls served to reduce the volatility. Post-reform, the spot rate volatility increased by a higher percentage than the NDF rate volatility and both the volatilities reached to a similar level.

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[1] During this period the Korean market was under a state of panic. This was because of the withdrawal by the Korean Government of its involvement in the currency market on 10 November 1997. The markets stabilized after an agreement to repay Korean debts was made by foreign creditors on 19 January 1998.

Measures for skewness and excess kurtosis indicated that the currency series are skewed and leptokurtic with respect to the normal distribution. This was confirmed by employing the Jacque-Bera normality test. Using Augmented Dickey–Fuller (ADF) unit root test with a time trend, he found that the level of spot and NDF rates were non-stationary time series and the data with first differences was stationary. He then tested the presence of linear and non-linear dependencies in data by employing Ljung–Box Q statistics for serial correlation of the spot and NDF rate changes and their squared series for 10 lags [L–B Q (10)], which indicated the presence of serial correlation in both the spot and NDF rate changes; and their squared series.

The distribution properties and other characteristics of data implied the presence of autoregressive conditional heteroskedasticity, i.e., volatility clustering, which can be properly specified by the ARCH (Autoregressive Conditional Heteroskedasticity) or GARCH (Generalized Autoregressive Conditional Heteroskedasticity) models.

Using Johansen's Cointegration [2] test, he found that the spot and NDF rates are cointegrated and each individual series was not stationary in both pre- and post-reform periods. This **confirmed the existence of a long-term equilibrium relation between the Won–Dollar spot and NDF rates**, even though there were differences in regulations and other institutional factors in both the markets.

"According to Engle and Granger (1987), if two variables are cointegrated, then there exists a vector-autoregressive representation of the first differences of the variables, with each equation augmented by one lag of the cointegrating residuals. In this model specification, changes in one variable can be related to the lagged changes of the other variable and its own past changes." Park then employed the Granger causality test that involved testing for the joint significance of the coefficients of the lagged changes of the other variables. The test results revealed a structural change in the causal relationship between the Won–Dollar spot and NDF markets surrounding the reform. He found a **unidirectional causality from the spot to the NDF market during the pre-reform period and a unidirectional reverse causality in the post-reform period.**

To test the presence of intermarket spillover effects, Park used an augmented GARCH model. He found that **the existence of bidirectional volatility spillover**[3] **effect from spot to NDF and vice-versa in pre-reform period; and a unidirectional volatility spillover effect in the post-reform period from the NDF to the spot market, but not in the reverse direction**. He also observed **unidirectional mean spillover**[4] **effect from the spot to the NDF market in the pre-reform period and from the NDF to the spot market in the post-reform period.** A bidirectional spillover effect indicates that information revealed in the previous trading day in one market is taken into account in the other market. This test also confirmed the results of Granger's Causality test.

Implications: This study made some extremely valuable contributions. It confirmed the existence of short-term dynamics and a long-term equilibrium relation between the offshore NDF and domestic currency markets. The relationship between these markets strengthened with the increase in the level of financial integration of markets. The existence of unidirectional mean spillover effects in opposite directions in different periods suggested that prior to the reform; the NDF rates were lagging the underlying spot rates, probably because of the government involvement in the currency market influencing the spot rates. Post-reform, the reductions in market imperfections in the domestic market and the increased influence of foreign factors made the offshore NDF market lead the domestic spot market in Korea. Hence, the deregulation of exchange rates had a substantial impact on the interrelation and information flows between the two markets. Park also appreciated the price discovery role of information in price innovations that originate in the offshore forward market and is transmitted to the onshore spot and forward markets after deregulation.

Limitations: Although this study by Park made a significant contribution to the understanding of the interlinkages between offshore NDF and onshore spot markets, it lacked the examination of onshore deliverable forward markets. So we carry forward this literature review with this need of including onshore forward markets in our scope and emphasizing on the Indian context.

Using the similar methodology, there was another study done in 2006 by Misra and Behera, to explore the interlinkages among the spot, forward and NDF markets for Indian rupee. At that time, the INR NDF was largely concentrated in Singapore and Hong Kong, with small volumes traded in the Middle East (Dubai and Bahrain) as well. Currently, London & Singapore have become the largest markets for INR NDFs (Misra & Behera, 2006) (Goyal, Jain, & Tewari, 2013). Over the number of years, there has been a phenomenal increase in the trading volume of INR NDF. "As per an estimate by HSBC for mid-2003, the daily volume for INR NDF was about US $ 100 million" (Misra & Behera, 2006). According to another study conducted by the Bank for International Settlements (BIS), the daily turnover in the offshore rupee NDF market was US $10.8 billion in 2010.

GROWTH IN INR NDF MARKET TURNOVER

	Average Daily NDF Turnover in London ($ millions)
April 2008	1,481
April 2009	1,312
April 2010	3,212
April 2011	4950
April 2012	5,159

Source: FXJSC Semi-Annual FX Turnover Survey

Thus, from the above table, we can see an increase of almost 250 percent in the NDF trading volume in the Indian rupee between April 2008 and April 2012, from $1.5 billion to $5.2 billion. "The use of NDFs is part of a larger structural change in growth, which is becoming more focused on emerging markets. As more emerging markets open up to foreign investment it is inevitable that there will be greater demand for emerging markets currency hedging" (Best practice in foreign exchange markets 2008)

INTERLINKAGES BETWEEN ONSHORE (SPOT AND FORWARD) AND OFFSHORE (NDF) MARKET FOR INDIAN RUPEE

Using the daily exchange rate data for the period November 2004 to February 2007 and employing a similar methodology, Misra & Behera, 2006 examined the causal link between the spot, forward and NDF market for Indian rupee.

The results of Granger's Causality test employed by them revealed the presence of **two-way causation between percentage change in spot and forward rupee-dollar rates; and a strong unidirectional causality from percentage change in spot to NDF rates and forwards to NDF rates**. **The causality from NDF to spot and forward markets remained statistically insignificant**. This reflects the fact that NDF market follows the spot markets in the sense that the prices in the NDF market are determined primarily on the basis of the RBI reference rate. **These results are contrary to the results obtained by Park, 2001 in regard to the Korean currency**. This is because India had very strict exchange rate controls then, and also strictly regulates the participation of domestic market players in offshore NDF rupee market. This also implied that the NDF markets were unable to predict the future level of the spot exchange rate. They also found that NDF rate volatilities were consistently higher than the onshore rate volatilities, because of government regulation in onshore markets. They further examined if the higher volatility in the NDF market had any spillover effects on volatility in the onshore markets. **The results of augmented GARCH model applied on sample data revealed that the mean spillover effect from both spot and forward to NDF market was statistically significant. The mean spillover effect from NDF to spot and forward was observed to be statistically insignificant.** This reflects that the information flows from spot and forward markets determine the returns in the NDF market. As regard to the **volatility spillover effects, they found bidirectional spillovers in spot and NDF markets.** However, the strength of volatility spillover from spot to NDF was relatively higher. They also observed a unidirectional volatility spillover effect from NDF markets to onshore forward markets.

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[2] A group of non-stationary time series is said to be cointegrated if a linear combination of them is stationary, i.e., the combination does not have a stochastic trend. The linear combination is called the cointegrating equation. A normal interpretation of cointegration is the existence of a long-term equilibrium relationship. On the other hand, lack of cointegration suggests that the series can wander arbitrarily far away from each other. (Park, 2001)

[3] Volatility Spillover Effect or contagion refers to the spread of market disturbances from one country/market to another; characterizes the structure of interrelationships across markets and shows how the conditional variance of one market is affected by the past conditional variance and the past shock of the other market (the variance of 1 at time t-1 affects the variance of 2 at time t) (Dornbusch, Park, & Claessens, 2000)

[4] Mean Spillover Effect suggest that two markets are somehow interdependent in terms of mean returns.

The activity in the NDF market is governed by various factors including further move towards capital account convertibility; further development of financial markets; introduction and availability of additional derivative products for both onshore and offshore investors so as to provide them with additional avenues for hedging in the domestic market, particularly to offshore investors; and relaxation or complete phasing out of the underlying exposure criteria for booking a forward contract. The underlying exposure criteria enable corporates to hedge only a part of their exposures that arise on the basis of the volume of goods (exports/imports) to be delivered (Misra & Behera, 2006) (Behera, 2011)

The investment climate of the emerging market economies (EMEs) and the shift of manufacturing to low-cost countries such as China and India led to increase in demand for trading in emerging market currencies. Increasing economic interest in EMEs, along with stringent foreign exchange convertibility restrictions in these economies led to the strengthening of the offshore foreign exchange market. The non-availability of an active onshore forward market for non-domestic players, private companies and investors investing in these EMEs, made NDFs a popular derivative instruments catering to the offshore investors' demand for hedging (Behera, 2011).

The effectiveness of capital controls in India has changed over time. It has been observed that *de facto* capital control barriers were asymmetric over inflows and outflows and made a gradual shift from primarily restricting outflows to effectively restricting inflows. In recent years, capital controls have been more symmetric over capital inflows and outflows and the deviations from covered interest rate parity (CIP) outside some reasonable boundaries were closed more quickly. Smaller deviations from covered interest parity are an indication of greater capital account openness since the advent of India's capital control liberalization. Various steps have been taken liberalize the capital account and to allow certain kinds of foreign capital flows, but a number of restrictions and discretionary controls still remain and keep us away from fuller capital account convertibility (Hutchison, Kendall, Pasricha, & Singh, 2010). Liberalization of capital controls in India is related to the development of INR NDF markets. One of the major developments in the currency markets of India was the introduction of exchange traded currency futures markets in September, 2008, as this platform was made available to larger number of market participants and offered a better and efficient price discovery mechanism compared to the rather restricted entry and opaque OTC markets. (Guru, 2009)

Another empirical study done by Behera in 2011 confirmed the absence of mean spillover impact of NDF markets on onshore spot, forward or futures market and the presence of significant volatility spillover impact of NDF market to onshore markets. He found an increase in the magnitude of volatility spillover from NDF to spot market post the introduction of currency futures in India, probably because of large arbitrage transactions that had taken place between futures and NDF market.

Sample Data & Methodology: The data used in the study by Behera, 2011 consisted of daily closing exchange rates of rupees per US dollar for spot, forward and NDF markets, from 5 November 2000 to 19 November 2009. The sample data was divided into three data sub-periods: full sample period; sub-period 1: 5 November 2000 to 28 August 2008; and sub-period 2: 1 September 2008 to 19 November 2009, to examine the changes in the onshore and offshore relationship of the rupee after the introduction of exchange traded currency futures in India on 29 August 2008.

He examined mean and volatility spillover between onshore and offshore rupee markets by using the trivariate multivariate generalized autoregressive conditional heteroscedasticity (MGARCH) model in vector autoregressive (VAR) framework, where the conditional mean and variance equations are estimated simultaneously, for three different markets –spot, forward and NDF.

Findings: Various trivariate GARCH models were fitted to different combinations of spot, forward, futures and NDF for different sample periods. Observations included indications of significant bi-directional mean spillover between spot and forward market; absence of any mean spillover impact from NDF to either spot or forward markets; significant influence on NDF by both spot and forward market.

Before the introduction of currency futures in India, spot and forward market had bidirectional shock transmission. However, when considered for full sample period it was observed that the shocks in forward market failed to significantly influence spot market volatility. However, the shocks in spot market continued to influence the volatility in forward market. Further, shocks in spot and forward market had no statistically significant impact on the volatility of NDF market before the introduction of currency futures, which became statistically significant when considered for full sample. There was bidirectional volatility spillovers observed between spot and forward before the introduction of currency futures. However, the volatility spillover from forward to spot became insignificant when considered for full sample data. Similarly, bidirectional volatility transmissions existed between spot and NDF market. Additionally, volatility spillovers existed from forward market to NDF market but not from NDF to forward market. The magnitude of volatility spillover from NDF to spot market increased after the introduction of currency futures in India. Post the introduction of currency futures, there were bi-directional mean spillovers between spot and futures markets; and their mean return was not influenced by NDF return. On the other hand, there was mean spillover impact from spot and futures market to NDF market. Both shock and volatility spillovers existed among spot, futures and NDF market, except the shock spillover impact from futures to NDF market. Moreover, volatilities in all the markets were influenced by their own previous volatility.

The results in mean equation showed the presence of mean spillover from futures to forward and NDF market and from forward to NDF market. However, futures market does not have any mean spillover impact either from forward or from NDF market.

Further, NDF market is impacted by mean spillover in forward market apart from its own. Shocks in forward, futures and NDF markets influence each other. The futures and NDF markets had volatility spillover from all the markets. Volatility in forward market was also impacted by the volatility in futures market apart from its own volatility, and not by the volatility in the NDF market. Thus, the study concluded that while the offshore NDF rates had no mean spillover impact on onshore spot, forward and futures market, shocks and volatilities in NDF markets influenced the onshore markets. The magnitude of volatility spillover from NDF to spot market increased after the introduction of currency futures in India.

As observed NDF markets have begun exerting increased influence on the domestic currency markets through spillover effects and better information content. There has been a transition from strong unidirectional causalities from spot to NDF rates and domestic forwards to NDF rates; to bidirectional causalities between returns in NDF and spot; and NDF and forward markets indicating that the information advantage that spot and domestic forward markets earlier had over the NDF markets no longer exists and that the spot and forward markets also obtain information from NDF markets in determining their levels. This has been observed over the sample data period of January 2007 to April 2009. (Guru, 2009)

Another attempt to evaluate the impact of introduction of exchange traded currency futures on the causal links between spot, domestic forwards, currency futures and NDFs was made by Guru in 2009. She applied Granger's Causality test on the returns data for the four markets, over a period September 2008 to April 2009, and found unidirectional causal links between spot and NDF market returns runs from NDF to spot markets and not vice versa post the introduction of currency futures. Similarly, between the domestic forward and NDF markets, it was the NDF market returns which were found to be leading and hence driving returns on the domestic forward markets and not vice versa. This is in contrast to the results of the study done by Misra & Behera in 2006 over the period of November 2004 to February 2007, which found strong unidirectional causalities from spot to NDF. The causality between NDF and currency futures runs from currency futures to NDF with the reverse causality being weak, indicating that currency futures markets, being organized, transparent and regulated, have more information content than the NDF markets. Thus, introduction of currency futures contributed to development of NDF markets .NDF markets, now generates signals for the domestic spot and forward markets (Guru, 2009).

These causality results are further supported by ARMA-GARCH models testing mean and volatility spillovers amongst all the three markets, from one to the other. These results suggested that past returns and innovations in one market exerts influence on the conditional mean and variance of the returns in the other market. The results revealed that the returns in spot markets were subjected to mean spillover effects from domestic forwards and NDF markets; domestic forwards markets were affected by currency futures markets through the volatility spillover effect; spot markets had volatility spillover effect and domestic forward markets had mean spillover effect on the NDF markets; and currency futures markets had volatility spillovers from spot and domestic forward as well as NDF markets.

Hence, there are interlinkages between each of the currency markets in the form of returns in one market influencing the mean level of returns in other market(s) or the volatility of one market having an effect on volatility in the other market(s). The NDF markets witnessed spillover effects from both spot and domestic forward markets and also exerted spillover effects on spot and currency futures markets.

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The above discussion shows how the interlinkages between onshore and offshore currency markets for rupee have evolved over time with increasing foreign inflows, development in onshore markets, changing nature of regulations and other policy initiatives to develop the Indian financial market.

After identifying the interlinkages, we shall discuss about the potential risks associated with NDF markets exerting an influence on onshore markets. One risk is that pressures for appreciation or depreciation may flow from the NDF market to the spot market by making capital flows larger and more volatile. Another risk is that the NDF markets might facilitate building sizeable speculative positions (Debelle, Gyntelberg, & Plumb, 2006). Large FIIs, MNC banks and corporate houses establish arbitrage deals to cash on the price differences that exist in domestic forward and offshore NDF markets. Such transactions are capable of affecting domestic markets and move the spot rate. So, we can say that offshore rupee NDF market plays a critical role in determining the value of rupee. "Being a 24×7 market, the offshore NDF market exerts considerable pressure on onshore currency markets, particularly when the market markets in Hong Kong and Singapore set the price movement of the rupee. A bearish or bullish trend in the NDF market sentiment is fragile for the rupee" (Singh, 2013).

When the rupee plunged to 68.85 to the dollar in August 2013, it was held that much of the speculative trade that led to the slide in the Indian currency took place in the offshore NDF market. In its Annual Report (2012-13), the RBI acknowledged that there is a long-term relationship between the spot and NDF markets for the rupee. "During the period of depreciation, shocks originating in the NDF market may carry more information, which gets reflected in on-shore segments of the market through mean and volatility spillovers" (Goyal, Jain, & Tewari, 2013).

It was observed that it was specifically during phases of downward pressure on INR that the movements in INR NDF market drove adjustments in onshore INR market. This has been empirically tested in a study by Goyal, Jain and Tewari in 2013, to examine the inter-linkages of onshore and offshore segments of India's foreign exchange market for Indian rupee, for a sample period of 6 June 2006 to 3 April 2013. The study employed vector error correction model (VECM) and ARCH/GARCH models to examine the direction of transmission between onshore and NDF markets. The sample data was divided into four sub-samples on the basis various phases of trend in rupee exchange rate. The methodology followed was similar to that discussed for the study conducted by Park in 2001 for Korean Markets.

TABLE 3: VARIOUS PHASES OF TREND IN RUPEE EXCHANGE RATE

Period 1	June 6, 2006 to January 2008	APPRECIATION	Prior to global financial crisis
Period 2	January 2008 to March 2009	DEPRECIATION	Global financial crisis
Period 3	March 2009 to August 2011	APPRECIATION	Recovery from global crisis
Period 4	August 2011 to April 3, 2013	DEPRECIATION	Post us rating downgrade

Source: (Goyal, Jain, & Tewari, 2013)
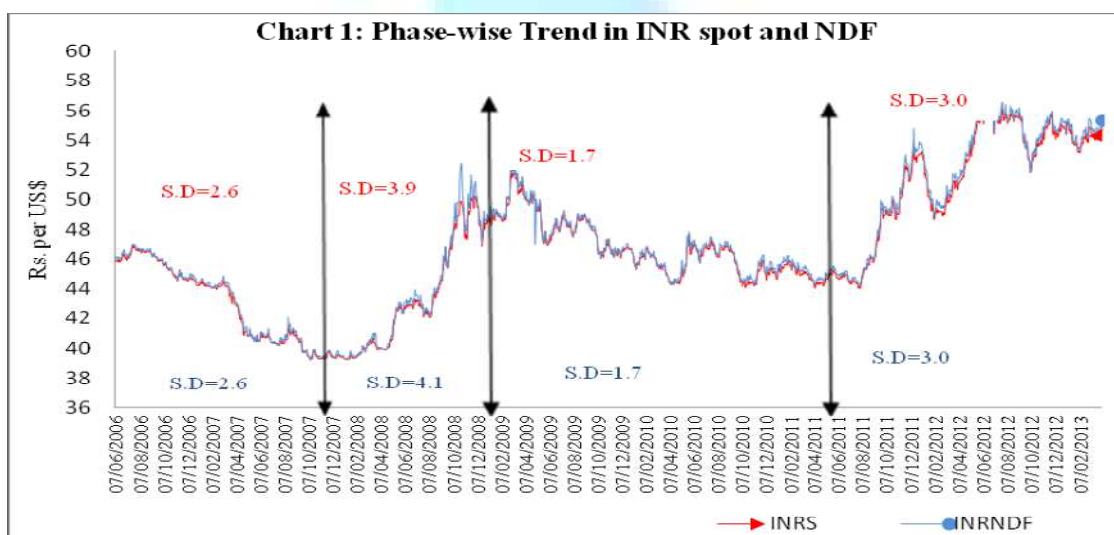
Source: (Goyal, Jain, & Tewari, 2013)

The test results confirmed **the presence of a long-term relationship in all sub-periods**. The adjustment behavior of both onshore and NDF exchange rate of INR towards long-term equilibrium was different across sub-periods. It was found that in sub-periods 1 and 3 which coincided with the **phase of rupee appreciation, both onshore and NDF segment of INR showed a tendency of adjustment**. It implied the presence of **bi-directional relationship between spot/forward rate and NDF rate of INR during period of rupee appreciation**. In contrast, during sub-periods 2 and 4, there appears to be only unidirectional causality from NDF rate changes to spot INR changes. Hence, **during period of rupee depreciation, movements in NDF segment leads and signals onshore segment's movements for the next day**. "It implies that information flow from offshore NDF market to onshore foreign exchange market more important for movements in both spot and forward segments." (Goyal, Jain, & Tewari, 2013). To get an idea on the nature of spillovers across both markets, ARCH/GARCH models were used. GARCH models also revealed bidirectional spillovers, either through mean or volatility or both, between onshore and offshore markets during sub-periods 1 and 3. However for sub-period representing the period of global financial crisis (Sub-period 2) and post-August 2011 (sub-period 4) when rupee came under downward pressure, there was an evidence of unidirectional volatility spill-over from NDF to onshore market. Hence, **during the period of rupee depreciation, only spot and forward markets seem to be responding to deviation from long-term equilibrium while in the period of rupee appreciation, both onshore as well as offshore markets show adjustment towards long-term equilibrium**. The fact that during periods of rupee depreciation, the RBI tries to mitigate volatility in foreign exchange market by undertaking various measures can be the reason for such an asymmetric behavior of spot/forward and NDF markets.

The study concluded that **during the period of depreciation in foreign exchange market, shocks originated in the NDF market seems to carry more information which gets reflected in onshore segments of market through mean and volatility spillovers**. Thus, whenever there is a downward pressure on currency, then it becomes more prone to pressures originating in offshore markets.

IMPORTANCE OF STUDY

It is critical to have the knowledge of the interrelation and information flows between the offshore NDF and domestic currency markets to understand financial market integration. A clear understanding of these interrelationships facilitates in policy formation and implementation. Designing and implementing independent economic policies to achieve desired results becomes extremely difficult for governments if the relationships between the offshore NDF and domestic currency markets are significant. Also, the knowledge of these relationships is inevitable for investors who seek NDF markets to hedge their currency exposure or take speculative positions to formulate their investment strategy. Additionally, the presence of these interdependences might mean that the markets are not equal in their capacity to discover new information and one of the markets may lead as a primary market for price discovery. (Park, 2001)

It has become increasingly important to exercise regulatory control of offshore NDF markets for Indian Rupee (INR) because of the growing activity in INR NDF markets and increased influence of INR NDF markets on onshore counterparts. We begin the review of literature with a study done in Korea, as this was the founding stone for most of the subsequent studies done for examining the interlinkages between offshore and onshore currency markets.

RECOMMENDATIONS

The growing activity in NDF rupee market and increasing influence of NDF rupee markets on onshore rupee markets suggests close monitoring of NDF markets. NDFs being OTC products are subject to minimal regulation. NDF rupee market is flourishing as a parallel market for Indian rupee outside India and outside RBI's regulatory jurisdiction. According to a study by the Bank for International Settlements (BIS), the daily turnover in offshore rupee NDF market increased to US $10.8 billion in 2010, nearly 52 percent of the total turnover ($20.8 billion) in foreign exchange forwards and forex swaps.

The NDF market for the rupee is mainly concentrated in Singapore, Hong Kong, Dubai, London and New York. In recent years, London has become a key center for trading in the rupee NDFs. According to FXJSC Semi-Annual FX Turnover Surveys, the average daily trading in rupee NDFs in London increased from US $1.5 billion in 2008 to US $5.2 billion in 2012, a jump of 250 percent (Singh, 2013).

There are no controls on the offshore participation in NDF rupee markets. However, the onshore financial institutions in India are not allowed to freely transact in the NDF markets. Domestic banking entities have specific open position and gap limits for their foreign exchange exposures and it is through these limits only that domestic entities participate in NDF market. "The main participants in the rupee NDF market consist of commercial and investment banks, hedge funds, currency speculators, international subsidiaries of Indian companies and big diamond merchants" (Singh, 2013).

As discussed, one of the serious risks associated with increased influence of NDF markets on domestic markets is that it has potential of strengthening the downward pressure on rupee, by adding to the negative sentiment of the market. "According to India Forex Advisors (a foreign exchange consulting and treasury management firm), a large demand for forward dollar pushes up forward rate and thereby influences the spot exchange rate in India. As witnessed during July-August 2013, the increased speculative trading in the NDF market exacerbated volatility in both the spot and the forward market in India" (Singh, 2013).

There are also significant transparency concerns associated with the operation of NDF transactions in overseas markets. Since NDFS are settled using an official reference rate determined by Central Bank or an industry group reference benchmark which is typically an average of rates from several banks and FX dealers, there can be attempts to influence spot rates by the parties interested in local currency so as to make profits while settling the NDFs carried in their books (Okongwu & Bruegger, 2012) This can be understood in the context of the LIBOR rigging scandal. LIBOR is considered the most critical global benchmark for short-term interest rates. According to the U.S. Commodities Futures Trading Commission, hundreds of trillions of dollars in securities and loans are linked to LIBOR. Barclays and fifteen other global financial institutions have been under international investigation for allegedly manipulating the LIBOR rate between 2005 and 2009, so that its traders could make profits on derivatives pegged to the base rate. LIBOR was maneuvered both upwards and downwards based on a trader's position. Manipulation of LIBOR distorts the trust of the marketplace and can actually lead to collapse of financial system (Alessi & Sergie, 2012).

"In the wake of LIBOR rate-fixing scandal, the Monetary Authority of Singapore (MAS) initiated a review of process for setting rates for NDFs in September 2012. The investigations carried out by MAS found that traders from 20 banks communicated with each other through email and electronic messaging to influence the NDF rate setting process run by the Association of Banks in Singapore" (Okongwu & Bruegger, 2012). Singapore is the world's fourth largest center for foreign exchange trading and has become Asia's hub for the trading in NDFs in the Indonesian rupiah, Malaysian ringgit, Vietnamese dong and Thai baht.

Thus, with this perspective it is inevitable to monitor and regulate the offshore activity in rupee for a stable currency environment. Although the NDF market is primarily meant to provide a platform to companies to hedge their foreign exchange risk and related exposures, the dominant players in this market are the speculators and arbitrageurs.

As we know, NDF markets developed in response to the difficulties encountered by non-resident companies in hedging their foreign exchange exposure because of the restrictions imposed on them in participating in onshore derivative markets. Some of the restrictions include not being allowed to directly participate in currency derivatives market, restrictions rebooking a forward contract onshore once cancelled and imposing higher margins or taxes. So, there is a need for increased liberalization in rupee trading and to provide for stable, liquid and transparent futures on currency pairs to serve hedging needs of local entities as well as international entities.

When there are taxes other restrictions on onshore trading, India loses trade to other countries and regulators lose control over currency. Easing restrictions to allow greater participation in the onshore foreign exchange market by overseas participants and accelerating financial sector reforms to provide for deep and functioning financial markets is required to reduce the growing influence of the highly volatile and unregulated NDF rupee market on the onshore rupee market.

The idea is not to eliminate the trading activity taking place in NDF markets, but to move it to domestic market under the purview of regulators. Allowing FIIs and non-resident Indians to trade in the currency futures market will both deepen the domestic currency market and bring it under the purview of domestic regulators.

One of the recent initiatives to regulate NDF trading and to make it transparent is made by the US through its Dodd-Frank Act which has bought NDFs under an electronic trading platform. It has provided for NDF clearing mandates by Swap Execution Facility (SEF), a platform created for regulated trading under Dodd-frank Act. Commodities & Futures Trading Commission (CFTC), in conjunction with clearinghouses will determine which NDF currency pairs are required to be cleared. SEFs will then make NDFs available for trading after selecting NDFs that they wish to list from the mandatory clearing list. Only the NDF pairs listed by SEFs can be traded through SEF. "The predominantly voice based, single platform NDF market is set to become electronic, multi-dealer platform focused" (Best Practice Guide 2012).

"To rein in rampant speculation and manipulative activities in the offshore NDF market, the RBI should work out arrangements with other regulatory authorities in the form of information sharing and the setting of general standards. Currently, a new regulatory framework for OTC derivatives market is under preparation following the Dodd-Frank Act in the US, the European Market Infrastructure Regulation (EMIR) in Europe and the Basel III standards. As a member of G20, India should engage in the ongoing international initiatives aimed at increasing transparency and reducing systemic risk posed by the $560 trillion global OTC derivatives market" (Singh, 2013).

CONCLUSIONS

The trading volume of currencies of emerging market economies has increased dramatically in the last three to four years. Given the existing convertibility restrictions on these currencies, NDFs account for a large fraction of the overall volume of foreign exchange trading in these currencies. A move to a fully flexible exchange rate regime in these economies would make NDFs obsolete. However, this is not expected to happen in the near future. As a consequence, the need and relevance of NDFs will continue to grow along. So, NDFs will continue to influence onshore markets and probably strengthen the potential vulnerability of domestic currency. So what is required is regulation and monitoring of NDF market. Standardizing NDF contracts, designing formal clearing mechanisms and providing for exchange based settlement can be a solution. We also require stable, liquid and transparent futures on currency pairs to serve hedging needs of different interest groups. Our ultimate goal should be to make our markets international and stable.

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