

# **An Overview of Non-Deliverable Foreign Exchange Forward Markets**

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## Executive Summary

In conjunction with the Committee on the Global Financial System work group project on foreign direct investment in emerging market financial sectors, staff of the Federal Reserve Bank of New York examined markets for different products used to hedge risks associated with emerging markets, including credit default swaps, political risk insurance, as well as non-deliverable forward foreign exchange contracts (NDFs). This note has also been substantially informed by the author's discussions with NDF market participants in the context of the ongoing global market monitoring efforts of the Federal Reserve Bank of New York's Foreign Exchange and Investments Desk. This note outlines the development and characteristics of the NDF market highlighting findings from discussions with U.S. commercial and investment banks as well as brokers active in the market.<sup>1</sup>

Of the firms interviewed for the CFGS project, most noted limited interest in using NDF contracts to hedge the underlying exposure associated with the firms' own foreign direct investment in emerging markets. Major international banks indicated that they are primarily involved in NDF markets through their role as market makers for their customers. In addition, many bank trading desks take positions in NDF currencies based on their views of the likely path of the underlying currency markets.

From a broader perspective, markets for non-deliverable currency forwards (NDFs) are of interest to policy makers because they are a product generally used to hedge exposure or speculate on a move in a currency where local market authorities limit such activity. NDF prices can be a useful tool for market monitoring in that these prices reflect market expectations and supply and demand factors that cannot be fully manifested in onshore currency product prices in a country with capital controls. The difference between onshore currency forward prices, where they are available, and NDFs can increase in periods of heightened investor caution or concern over potential change in the exchange rate regime or a perceived increase in onshore country risk. Prices in the NDF market can be a useful informational tool for authorities and investors to gauge market expectations of potential pressures on an exchange rate regime going forward.

## Product Description

An NDF is similar to a regular forward foreign exchange contract, except at maturity the NDF does not require physical delivery of currencies, and is typically settled in an international financial center in U.S. dollars. A forward foreign exchange contract is an obligation to purchase or sell a specific currency on a future date (settlement date) for a fixed price set on the date of the contract (trade date).<sup>2</sup> For an NDF contract at maturity, settlement is made in U.S.

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<sup>1</sup> The views expressed herein are those of the author and do not necessarily reflect the views of the Federal Reserve Bank of New York or the Federal Reserve System. The author gratefully acknowledges the assistance of numerous Federal Reserve staff in the development of this paper including B. Gerard Dages, Diane Virzera, Steve Weinberg, Dorothy Sobol, and Angela Meyer.

<sup>2</sup> New York Law Journal, May 8, 2002.

dollars—the other currency, usually an emerging market currency with capital controls, is “non-deliverable”.<sup>3</sup>

According to the terms of an NDF contract, if on the settlement date, the then-prevailing spot market exchange rate is greater (in foreign currency per dollar terms) than the previously agreed forward exchange rate, the holder of the contract who is long the emerging market currency must pay the holder of the other side of the contract the difference between the contracted forward price and the spot market rate.<sup>4</sup> The contract is net-settled in US dollars based on the notional amount. The settlement exchange rate is determined by a daily-posted rate (usually posted to a specific Reuters or Telerate screen), referred to as the “fixing rate.” The fixing rate is generally based on the spot rate traded for the currency onshore.

The pricing of most forward foreign exchange contracts is primarily based on the interest rate parity formula which determines equivalent returns over a set time period based on two currencies’ interest rates and the current spot exchange rate.<sup>5</sup> In addition to interest rate parity calculations, many other factors can affect pricing of forward contracts such as trading flows, liquidity, and counterparty risk. NDF prices can also be affected by the perceived probability of changes in foreign exchange regime, speculative positioning, conditions in local onshore interest rate markets and the relationship between the offshore and onshore currency forward markets.<sup>6</sup> When international investors have little access to a country’s onshore interest rate markets or deposits in local currency, the NDF prices for that currency are based primarily on the expected future level of the spot exchange rate. For example, in the fall of 2003, NDF prices for the Chinese *yuan* declined to historic lows, primarily due to expectations that Chinese authorities would allow the *yuan* to appreciate against the dollar. Interest rate parity calculations generally do not affect NDF prices in Chinese *yuan* given that offshore investors have very limited access to onshore Chinese *yuan* interest rate products.

Major NDF market trading began in the early 1990’s, initially as a means for companies to hedge their exposure to currency fluctuations of emerging market countries with actual or potential foreign exchange convertibility restrictions. NDF trading developed in offshore financial centers, outside the jurisdiction of countries with foreign exchange convertibility restrictions. Over the years market growth has been greatest in NDFs for currencies of countries where investors (with portfolio and/or foreign direct investment) have become increasingly active or where a significant adjustment to the local currency exchange rate regime has been expected. Conversely, NDF markets in currencies of countries that have allowed increased capital convertibility, to the point where currency hedging is fully available onshore, have dissipated and/or disappeared.

Initially, most NDF trading was in Latin American currencies. Trading volume in NDFs began to increase in 1994 after voice brokers entered the market as intermediaries facilitating interbank

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<sup>3</sup> NDFs are usually settled in dollars. Standard NDF contract documentation generally specifies price determination (a fixing rate) based on an exchange rate against the dollar, and therefore there is very limited trading in NDFs against other major currencies. There are other types of foreign exchange products that settle only in one currency. An example is Brazilian currency futures traded on the Brazilian Mercantile and Futures Exchange. These are settled in Brazilian *real*, and the dollar component is non-deliverable. This note focuses on NDF contracts settled in U.S. dollars.

<sup>4</sup> To be long the emerging market currency means that the holder of the NDF contract is the “buyer” of the emerging market currency and the “seller” of dollars. Conversely, if the emerging market currency appreciates relative to the previously agreed forward rate, the holder of the contract short the emerging market currency pays the counterparty to the contract.

<sup>5</sup> Day count conventions can vary from market to market but a basic formula for determining an outright price for a currency forward or an NDF contract is: (spot rate-quoted currency X per dollar)\*((currency X interest rate) \* (# of days/360))/((dollar interest rate)\*(# of days/360)). For most currencies in most cases, one-month interbank deposit interest rates for both currencies could be used to determine the likely market level of the one-month outright forward price.

<sup>6</sup> For example, Brazil has a very active onshore currency futures market which by far dwarfs the NDF market. Since some NDF traders offset trades in the onshore market, this market can have a significant effect on NDF pricing.

trading, which allowed dealers to more easily offset positions with one another that they had accumulated from their market making activities for clients.<sup>7</sup> At that time, Mexican *peso* NDFs had the largest trading volume, reflecting market participant expectations for a devaluation of Mexican *peso* from its then-fixed level against the dollar.

As investment flows into emerging economies grew, the NDF market increased and expanded beyond Latin currencies to Asian and eastern European currencies. The NDF market became sufficiently established that the International Swaps and Derivatives Association (ISDA) added settlement provisions for NDF transactions to its 1997 draft of FX and currency option definitions. Interest in NDF trading further increased leading up to the Asian crisis of 1997, amid expectations for local currency devaluations in several countries. Experience suggests that NDF markets are likely to be most developed for countries with significant cross-border capital movements but remaining convertibility restrictions, but NDF trading declines in cases once convertibility appears to be firmly established.

### Market Overview

Given that NDFs, like deliverable currency contracts, are primarily an over-the-counter, rather than exchange-traded product, it is difficult to gauge the volume of contracts traded, who trades the contracts, and where they are traded. In general New York tends to dominate trading in Latin American NDFs, Singapore (and to a lesser extent Hong Kong) dominate trading in non-Japan Asian NDFs, while London spans these markets.

NDF trading volume can be highly volatile due to a variety of factors including speculative interest in the market. Given that the trading style of hedge funds tends to favor relatively frequent and large transactions, expectations and speculation on the potential currency regime change, can rapidly increase NDF volume for a particular currency.

While an NDF is primarily an over-the-counter product that market makers such as major banks write for their customers, these banks often use the services of third-party NDF voice brokers to mediate the purchase of offsetting NDF transactions with other major banks. Voice brokers facilitate banks' ability to offset the currency risk associated with NDF transactions. While broker markets for major currencies have basically disappeared, market makers suggest that as much as 80 percent of their non-client NDF trades are mediated by brokers rather than directly bank-to-bank. With the aid of brokers, NDF business-line managers at financial firms suggest that major NDF markets generally have sufficient depth and liquidity to enable quick offsets of their positions incurred through market-making activities. In addition, some major market makers for NDFs have a greater tolerance for warehousing NDF market risk and maintain and manage a large book, deciding to offset less of their positions in the broker or direct bank-to-bank market.

In the case of some countries with relatively well-developed onshore currency and interest rate markets and sufficient regulatory flexibility, notably Korea and Brazil, major international banks are able to offset the currency risk of their NDF positions to some extent with onshore counterparties.<sup>8</sup> NDFs nearly always trade at a premium to local market products given the lower perceived counterparty credit risk and currency convertibility risk for NDFs. In addition, NDF prices reflect lower transactional costs, given the regulatory complexities of dealing with

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<sup>7</sup> Derivatives Strategy, July 1996.

<sup>8</sup> Korean authorities briefly sought to limit the effect of NDF demand on local markets by restricting local banks' participation in the NDF market. The presumed intent was to lessen the need for central bank intervention as the effect of foreign demand for long *won* positions would be limited onshore. The regulations were reportedly seen as adversely affecting local banks and were subsequently largely rescinded.

products in semi-convertible currencies. When the perceived onshore risk premium increases, the difference between onshore and offshore currency forward prices tends to diverge further.<sup>9</sup>

For instance, Korean *won* NDF volume is estimated to be the largest of any currency, with 30 percent of total NDF volume according to the Emerging Market Traders Association 2003 survey.<sup>10</sup> Much of this volume is estimated to originate with international investment portfolio managers hedging the currency risk associated with their onshore investments. Korean equity markets have a relatively high level of foreign participation and significant proportion of Korean publicly listed shares are owned by offshore investors. In contrast, Chinese *yuan* NDF volume was 6 percent of the 2003 total volume. Portfolio flows into China, such as in debt or publicly listed shares, are much more limited, and dealers note that much of the volume in Chinese *yuan* NDFs is generated by speculative positioning based on expectations for an alteration in China's current, basically fixed exchange rate. In general, discussions with NDF market makers generally indicate that only a small proportion of customer demand for NDFs is currently based on interest to hedge currency exposure associated with foreign direct investment.

The volume of Brazilian *real* NDF trading is also partially attributed to the relative abundance of onshore currency products. Brazil has an active onshore futures market and some offshore NDF traders that have gained access to this market seek to capture the premium for NDFs versus onshore currency forwards and futures as long as they consider that this premium compensates for the convertibility and local counterparty risk (which tends to be the Brazilian Mercantile and Futures Exchange (BM&F)).<sup>11</sup> Limiting this potential arbitrage opportunity are firms' onshore risk limits, which tend to decrease amid periods of market disruption. In addition, in order to access onshore futures markets, traders must post local Brazilian government notes as collateral for their positions with the local futures exchange, multiplying onshore exposure.

### **Emerging Market Trade Association 2003 NDF Market Volume Survey**<sup>12</sup>

<b>Volume of Top Five NDF Contracts</b>		<b>Share of Total (US \$1.021 trillion)</b>
Korean won NDF	US\$307 billion	30%
Chilean peso NDF	US\$180 billion	18%
Brazilian real NDF	US\$179 billion	18%
Taiwanese dollar NDF	US\$163 billion	17%
Chinese yuan NDF	US\$68 billion	6%

<sup>9</sup> In countries where regulations permit greater access for local entities to the offshore NDF markets, and offshore entities greater access to onshore product markets, NDF prices will affect and be affected by local product market prices. NDF prices for Brazilian *real* and Korean *won* are the best examples of these conditions. Where cross-border market access is more limited, NDF prices will reflect primarily offshore supply and demand factors. NDF prices for the Chinese *yuan* are an example of this phenomenon.

<sup>10</sup> Although the Korean *won* is allowed to float more freely than some other emerging market currencies, there are still restrictions on full convertibility of the *won*. For instance, documentation of an approved underlying purpose for purchase of *won* is still required of foreign investors.

<sup>11</sup> Onshore currency futures trading in Brazil by far dwarfs the volume in the NDF market. For instance, on March 31, 2003, BM&F floor-trading volume in foreign exchange futures totaled approximately \$4.6 billion notional. Interest rate futures contract trading totaled approximately \$6.2 billion. Traders often use a combination of interest rate futures products to create synthetic forwards. All contracts on the BM&F are only deliverable in Brazilian *real*. This compares to the EMTA volume survey which showed Brazilian NDF volume at \$163 billion in 2003. For the most recent BM&F data on volume, please refer to the exchange's website (<http://www.bmf.com.br/indexenglish.asp>).

<sup>12</sup> Given the absence of some major participants from this survey, the survey results should be seen as indicative of relative volume levels of different NDF contracts, rather than overall absolute volume levels of the market. The relative volume levels as indicated by this survey are generally in line with current market participants' anecdotal reports which indicate a large volume of Korean and Brazilian NDF trading and small but rising interest in Chinese NDF trading at present. For greater detail on the survey please refer to the EMTA website (<http://www.emta.org/>).

## Current Uses of the NDF Market

Currently, estimates vary but many major market participants estimate as much as 60 to 80 percent of NDF volume is generated by speculative interest, noting growing participation from international hedge funds. Major financial institutions generally are primarily involved in NDF markets through their market-making activities. These market-making activities are a service to their customers for which the firm is compensated by a bid/ask spread as well as effective management of the firm's NDF book. Currently, major international banks primarily offset NDF positions incurred through market-making activities with other major banks through the broker market, but also deal directly with other banks and onshore market players and exchanges.

For risk management purposes, financial institutions interviewed for the CFGS work group project generally did not consider an NDF contract with a G-7 counterparty as having emerging market country risk. NDF contracts were not considered as having any element of sovereign risk even though NDF contracts usually specify settlement to a locally posted spot exchange rate ("fixing rate"), often generated by an official sector onshore entity.

As intermediaries, market-making firms are exposed to basis risk -- the potential that offsetting contracts settle at different rates in the event of a disruption to the posting or perceived accuracy of the local rate. However, under normal market conditions, this risk generally does not significantly limit firms' market-making activities.

## Some Limitations of NDFs as Risk Management Tools

Despite the growth of NDF markets, particularly for currencies of countries attracting significant foreign investment but with some capital controls remaining, market participants cite a variety of limitations of NDFs as risk management tools. For instance firms interviewed as part of the CGFS work group project indicated that they tend not to use NDFs to transfer risks associated with their own foreign direct investments into emerging markets. In general, market participants suggest that NDFs do not exhibit sufficient correlation with broader and more significant country risks beyond currency risk. In fact, NDFs only offer protection against fluctuations in the "fixing rate" for a currency. Often this rate is a rate generated and posted by onshore authorities based on local spot market trading. The NDF offers no guarantee that the holder of the contract will actually be able to trade foreign exchange at the fixing rate. Indeed, when a change in exchange rate regime is increasingly likely, there is often a greater likelihood that the validity of the fixing rate as an indication of where the spot market is trading or a price where a major trade can be transacted is significantly diminished.

There have been a few recent examples that have called into question the usefulness of NDFs as a hedging product in periods of market crisis, presumably when the protection the contracts offer would be most desired. In late 2001 amid political and financial market upheaval, the Argentine peso's one-to-one peg against the dollar was broken. Argentine authorities called an unscheduled market holiday for three weeks, which led to a disruption in determining the settlement rate of outstanding peso NDF contracts.<sup>13</sup> EMTA and the Foreign Exchange Committee (FX Committee) recommended delaying settlement of NDFs until foreign exchange trading in Argentina resumed. Even after foreign exchange trading resumed, the NDF market in pesos was stymied by continued uncertainty over fixing rates to be used for settlement. In the case of Venezuela, during 2003 an unscheduled holiday also disrupted NDF contract valuation. Also disrupting the process was the Venezuelan central bank's eventual posting of a spot rate

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<sup>13</sup> An unscheduled foreign exchange holiday occurs when local monetary authorities announce a cessation of local market trading, without 2 days prior notice.

based on the newly declared official exchange rate. This official rate was not based on any actual trades that had been or could be conducted at that level at that time, which led to questions of its “price materiality” and thus legitimacy as a fixing rate for NDF valuation.

In order to mitigate limitations of NDF contracts, particularly apparent in periods of market disruption, EMTA and the FX Committee are continuing to work to improve standard NDF documentation for currencies in both Latin America and Asia.<sup>14</sup> These efforts are aimed at establishing set procedures for use of alternative pricing sources when there is a disruption to the primary fixing rate used for the contract. These fixing mechanisms, such as surveys of onshore, and subsequently offshore firms, improve certainty over the validity of an NDF contract in periods of market disruption. These fixing mechanisms also result in reduced basis risk for market makers as they are not forced to negotiate fixing rates with each of their counterparties, potentially at different rates. However, disruptions to the primary fixing rate often occur in conjunction with significant local spot market dislocations, making the attainment of a valid alternative rate difficult despite these survey methods.

Even should local market trading and fixing rate posting continue amid a currency crisis, there are additional concerns about the usefulness of NDFs as a hedging product in periods of market stress. NDFs do not ensure spot market convertibility near the NDF fixing price to which they are settled. Although NDFs compensate the holder of a short local currency position after a depreciation of the local currency, this compensation in no way provides assurance that the underlying local exposure that was hedged can be converted to dollars at the NDF fixing price, or even at any price. In a crisis situation, market liquidity usually decreases. Amid decreased liquidity, a large trade to repatriate onshore exposure is highly likely to move the spot market, making the protection originally provided by the NDF position less significant. A firm hedging onshore local currency receivables or equity investment remains dependent on a functioning local country foreign exchange market to convert its receipts or proceeds back to dollars.

Given the limitations of NDF contracts discussed above, major international banks generally do not use NDFs themselves to hedge the exchange rate exposure generated by their own foreign direct investment into emerging markets. This is partly due to the fact that NDF contracts with one year or greater maturity tend to have bid/ask spreads seen as unattractive. In addition, banks generally see country risks, such as increased restrictions on capital convertibility, as much more significant risks to their long-term investment returns than exchange rate fluctuations. They suggest that NDF prices and even the local spot market exchange rate are not well correlated with the broader country risks which include tightened currency convertibility restrictions.

## Outlook

Given the likely ongoing existence of convertibility restrictions for currencies of countries with significant foreign investor involvement, a global NDF market is likely to continue. NDF prices can be a useful market monitoring tool, reflecting market forces that cannot be manifested in onshore markets. Once a country moves to a more convertible exchange rate regime and onshore counterparties are permitted to transact in NDFs with international counterparties, NDF market liquidity can potentially contribute to liquidity and volume in onshore currency product markets. Once a currency becomes fully convertible, NDF markets tend to disappear. NDF markets can be seen as an intermediate tool in the progress of market development from limited to fuller capital convertibility.

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<sup>14</sup> For the most recent developments in NDF documentation please refer to the Foreign Exchange Committee website (<http://www.newyorkfed.org/fxc/>) and the EMTA website (<http://www.emta.org/>).