

# Understanding Foreign Exchange Derivatives Using Trade Repository Data: The Non-deliverable Forward Market

By Monetary Management Department

## 1. Introduction

In recent years, Hong Kong has established a regulatory framework for over-the-counter (OTC) derivatives consistent with global standards, and implemented reforms in regulatory reporting, central clearing, as well as capital and margin requirements on uncleared derivatives. These developments are in line with the G20 commitment in 2009 to enhance transparency and reduce systemic risk in the OTC derivatives market.

Starting from July 2017, under the requirement of regulatory reporting, all entities supervised by the HKMA or regulated by the Securities and Futures Commission (SFC), and certain central counterparties (CCPs), have to report their OTC derivatives transactions in the five asset classes of interest rate, foreign exchange (FX), credit, equity and commodity. Among these asset classes, the mandatory reporting of interest rate swaps and FX non-deliverable forwards (NDFs) started two years earlier in July 2015.

Hong Kong is a major trading centre for FX derivatives, and NDFs in particular, with an estimated 10% of global turnover of FX derivatives trading and 30% of NDF trading.<sup>1</sup> Similar to other FX derivatives, the NDF is a forward contract for hedging currency risk or profiting from currency volatility, albeit subject to a different settlement process that makes its use attractive for certain currencies (see Box 1 for more detail). NDFs represent an estimated 16% of the overall FX derivatives market in Hong Kong by gross notional value.

This article presents a description of the NDF market as seen through the data collected in Hong Kong at the beginning of 2018, and sets out the major developments in the market over the two years of 2016–2017. The results are derived from analysis of trade-level data reported to the Hong Kong Trade Repository (HKTR).<sup>2</sup> In terms of market structure, the NDF market is mostly traded at very short maturities. The major non-deliverable currencies are the Taiwanese dollar, the Korean won and the renminbi. Most of the outstanding positions are held by banks and other financial entities. Over the past two years, the NDF market experienced three major changes: a marked increase in central clearing; a change in currency composition; and an increasing involvement by other financial institutions relative to banks.

### Box 1

#### NDF: What is it?

The NDF is a forward contract with a different settlement process. As in a standard forward contract, two counterparties agree to buy/sell a currency at a specified future date at an agreed exchange rate. The purpose is to lock in an exchange rate for a certain period in the future. At settlement, instead of exchanging the underlying currencies, NDF counterparties settle the trade's profit or loss in a widely traded ("deliverable") currency, most often the US dollar. The amount settled is the difference between the exchange rate agreed in the contract and the prevailing exchange rate observed at a specified future date, multiplied by the agreed notional amount. The most prevalent non-deliverable currencies are Asian and Latin American currencies.

<sup>1</sup> Based on turnover statistics from Bank for International Settlements (BIS) (2016), Triennial Central Bank Survey – Foreign Exchange Turnover in April 2016 ([www.bis.org/publ/rpfx16fx.pdf](http://www.bis.org/publ/rpfx16fx.pdf)) and internal calculations using HKTR data.

<sup>2</sup> For more information on the data used in this article, see Box 3: Trade repositories as a data source.

## 2. Stylised facts on the NDF market

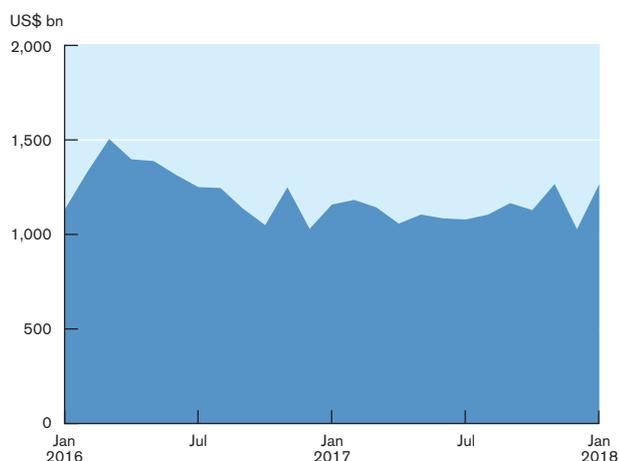
### a. Size of the NDF market

On 31 January 2018, the HKTR contained trade-level information on 130,993 NDF outstanding positions. Their gross notional value was US\$1,265 billion after removing double counting from trades reported by both counterparties.

Chart 1 illustrates the change of NDF outstanding positions over time. During 2016–2017, the gross notional value of NDF outstanding positions fluctuated between a peak of US\$1,503 billion in March 2016 and a trough of US\$1,028 billion in December 2017 (which points to a potential seasonal effect at year end).<sup>3</sup> From January 2016 to January 2018, the NDF gross notional outstanding was on average US\$1,191 billion.

CHART 1

#### Gross notional value of NDF outstanding positions



Source: HKTR positions for public disclosure.

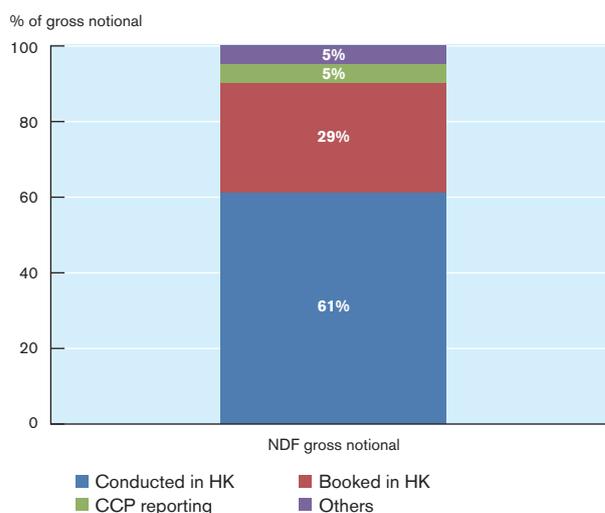
Note: Trades reported by both parties are counted only once.

As Hong Kong is an international financial centre, the reporting rules require the reporting of trades booked in Hong Kong as well as trades “conducted in Hong Kong” (in short, traded in Hong Kong, but booked in other locations).<sup>4</sup> Information on these trades is important for understanding the market dynamics (for example liquidity and the formation of prices).

Information on trading desk and booking location of the trades is used to distinguish the two types of trades. For the positions outstanding on 5 January 2018, 29% of NDF trades (measured by gross notional outstanding) were booked in Hong Kong and 61% were conducted in Hong Kong (Chart 2). The large share of NDF trades conducted in Hong Kong is consistent with the high number of international institutions active in the local financial market. In addition, 5% of the gross notional value of outstanding positions in the HKTR was reported by CCPs.<sup>5</sup>

CHART 2

#### NDF positions booked vs conducted in Hong Kong



Source: HKTR, 5 January 2018 positions.

Note: “Others” includes positions that appear neither booked nor conducted in Hong Kong (thus potentially reported voluntarily).

<sup>3</sup> Both in 2016 and 2017, the gross notional outstanding dropped by almost 20% and recovered the following month.

<sup>4</sup> Trades conducted in Hong Kong are trades in which one of the individuals who made the decision to enter into the transaction is a trader employed in Hong Kong, and which are conducted on behalf of, and booked in, an affiliate entity of the same group. As part of this requirement, entities report information on the trading desk and the booking location of trades. For details, see Q20 in *FAQs on the Securities and Futures (OTC Derivatives Transactions – Reporting and Record Keeping Obligations) Rules*, Oct. 2017.

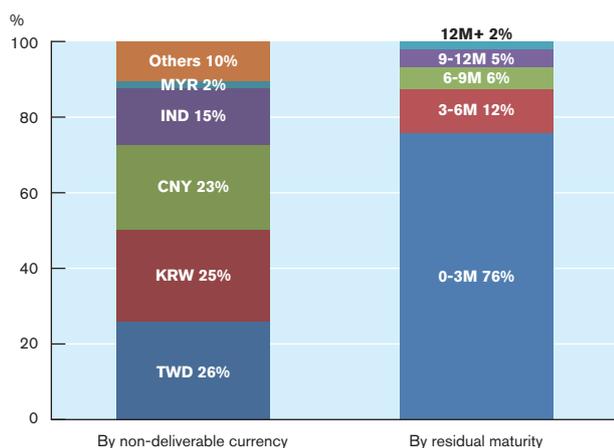
<sup>5</sup> There is a mismatch between the share of trades reported by CCPs and those reported with CCPs as counterparty, mainly because the reporting requirement for CCPs applies only to trades with counterparties incorporated in Hong Kong.

### b. Currencies and maturities

Unsurprisingly, Asian currencies represent the lion’s share of non-deliverable currencies traded in Hong Kong. In January 2018, the Taiwanese dollar was the most prevalent non-deliverable currency, accounting for 26% of the outstanding gross notional (Chart 3). Other major non-deliverable currencies were the Korean won (25% of gross notional), the renminbi (23%), the Indian rupee (15%) and the Malaysian ringgit (2%). The remaining 9% of gross notional was comprised of a very broad range of currencies, including a number of Latin American currencies, each accounting for less than 2% of the gross notional.<sup>6</sup> US dollar was the settlement currency in nearly all of the NDF trades (99% of the gross notional).

The maturity of NDF trades tends to be relatively short. Over three quarters of the NDF outstanding trades, measured by gross notional value, had a residual maturity of up to three months (Chart 3). Maturities between three months and one year accounted for another 23%. NDF trades with a remaining maturity over one year accounted for less than 2%.

**CHART 3**  
Currency and maturity breakdown of NDF positions



Source: HKTR, 5 January 2018 positions.  
Note: Percentages do not sum to 100 due to rounding effects.

### c. Market participants

In line with the OTC derivatives market in general, the NDF market is relatively concentrated around the top dealers. As shown in the HKTR data as at 5 January 2018, 129 financial entities (which belong to 70 groups) reported NDF trades to the HKTR. The top five institutions accounted for 48% of the outstanding gross notional while the top ten entities accounted for 64% of the gross notional (Chart 4).

**CHART 4**  
Market participants subject to mandatory reporting



Source: HKTR, 5 January 2018 positions.  
Note: Excludes CCPs.

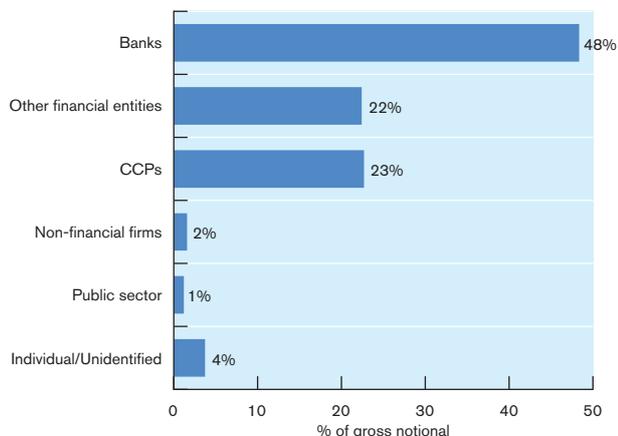
Trade counterparties are significantly more diverse. As shown in the same set of data, 2,400 distinct entities, which belong to around 1,600 groups, were identified. Chart 5 presents a breakdown of trade counterparties by sector. In 48% of the trades (by outstanding gross notional), banks were the counterparty. The non-bank financial sector (which includes investment banks, asset managers, hedge funds and insurers) was counterparty to 22% of the outstanding gross notional. CCPs were counterparty to 23% of trades (by outstanding gross notional), reflecting their increasing involvement in providing central clearing to the NDF market. The corporate non-financial sector accounted for 2% of the outstanding gross notional, while public sector institutions, private individuals and unidentified entities accounted for the remaining 5%.<sup>7</sup>

<sup>6</sup> Globally, Latin American currencies represent an important cluster of non-deliverable currencies, but they are not heavily traded in Hong Kong, likely due to time zone differences.

<sup>7</sup> “Unidentified” entities are those that are unable to be classified in terms of sector of activity and country of incorporation.

**CHART 5**

**Sectoral breakdown of market participants on the counterparty side**

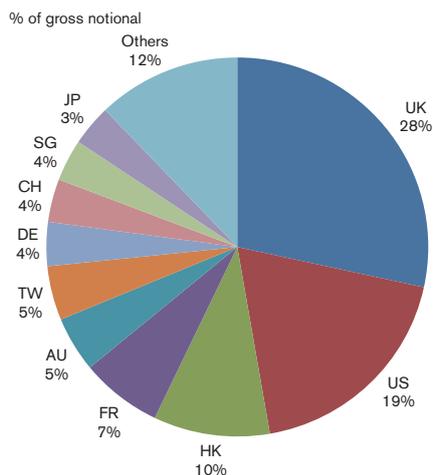


Source: HKTR, 5 January 2018 positions.

Geographically, trade counterparties were domiciled mainly in the UK and the US, representing 28% and 19% of the outstanding gross notional respectively (Chart 6). Counterparties domiciled in Hong Kong made up 10% of the gross notional, while France took up 7% of the share, and Australia and Taiwan each constituted 5%. A large number of other countries, each contributing small shares, accounted for the remainder of the outstanding gross notional.

**CHART 6**

**Geographical split of market participants on the counterparty side**



Source: HKTR, 5 January 2018 positions.

Note: Excludes CCPs. "Other" includes Unidentified counterparties, which account for 5%.

**d. Currency risk transfer by economic sector of counterparties**

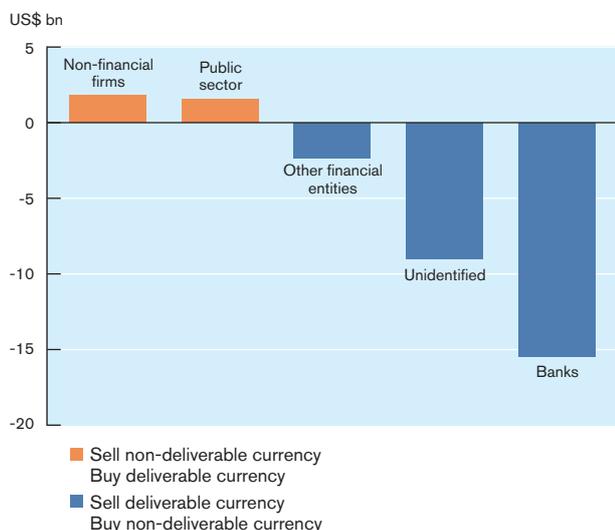
FX forwards, including NDFs, have the primary purpose of transferring currency risk between two counterparties by locking in an exchange rate for a certain period in the future. Based on the exchange rate prevailing in the market at the specified future date, one counterparty will gain a profit and the other will experience a loss.

Market participants enter the NDF market for different reasons. Some market participants use NDFs to offload ("hedge") the currency risk arising from either long or short currency positions linked to business activities and involving a non-deliverable currency. The currency risk is acquired by their trade counterparties, who do so possibly to speculate on the future movement of the exchange rate, or to arbitrage between rates in the spot and forward markets, or to hedge other positions.

The question arises whether NDF market participants belonging to different sectors take systematic positions in one direction or the other. As a "thought experiment", we plot the net notional value of positions at the sectoral level (Chart 7). This is computed by converting all positions in a common currency (US dollar) and offsetting short and long positions across entities within the same sector. The result shows that, on a sectoral basis, non-financial firms and the public sector tend to take net positions aimed at offloading currency risk from non-deliverable currencies. This is consistent with the NDF market serving a primary economic function of hedging. On the other hand, banks and other financial entities tend to acquire currency risk. They are effectively the providers of market liquidity for this OTC derivative product.

**CHART 7**

**Currency risk transfer in the NDF market by types of counterparty**  
(Net notional positions in non-deliverable currencies by sector)



Source: HKTR, 5 January 2018 positions.

Notes:

1. Excludes CCPs and Individuals.
2. While net notional positions computed across the whole market by definition offset each other, in the chart the orange and blue bars do not have to offset each other in size. Each sector has entities engaging in both sides of NDF trades. The size of the bar is from offsetting long and short positions within the same sector, whereas in reality many NDF trades are between entities from different sectors.

### 3. Changes in the structure of the NDF market

The analysis of HKTR data suggests that during 2016–2017, the NDF market structure changed along three dimensions:

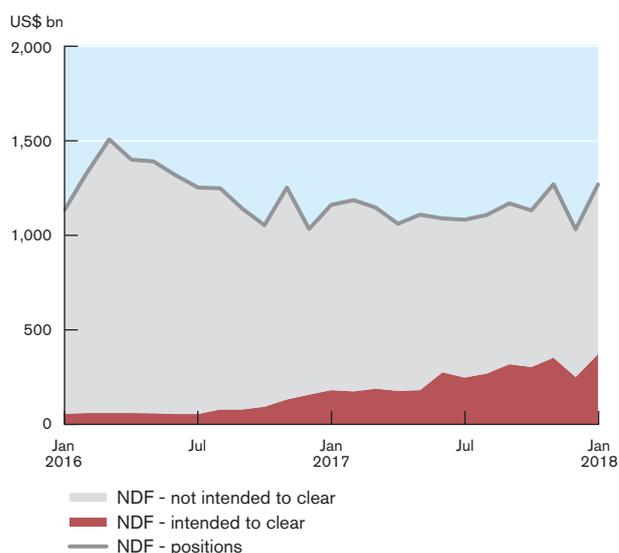
- Sharp increase of central clearing of NDFs;
- Change in the currency composition of NDFs; and
- Shift of some NDF activities from banks to other financial institutions.

#### a. Sharp increase of central clearing of NDFs

During 2016–2017, the NDF market experienced a marked increase in NDF trades being cleared through central counterparties (Chart 8). This is consistent with other market reports analysing CCPs' public disclosures.<sup>8</sup> The rise in central clearing in the NDF market is voluntary as central clearing of NDF is not mandated in any major jurisdiction.

**CHART 8**

**Gross notional value of outstanding NDF positions being centrally cleared**



Source: HKTR positions for public disclosure.

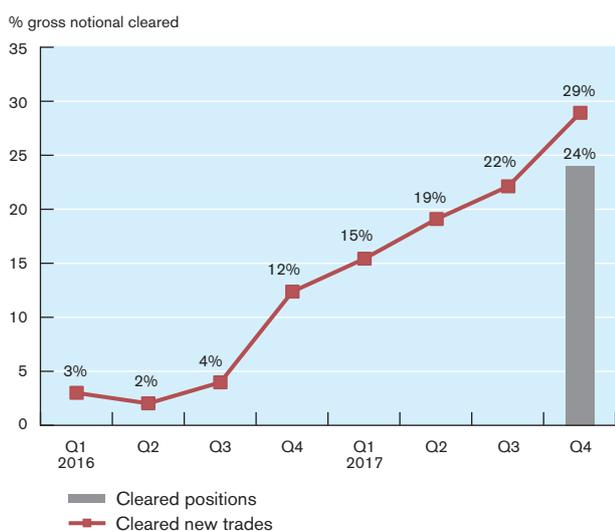
Note: "Intended to clear" is a field reported by the reporting entity. Trades reported by both parties are counted only once.

As shown in the HKTR data as at 31 January 2018, the gross notional outstanding intended for central clearing (which includes trades that had been cleared as well as bilateral trades that were expected to go through central clearing) was US\$372 billion, up from US\$181 billion a year earlier and from US\$56 billion two years earlier.

<sup>8</sup> Chris Barnes (2017), *FX Clearing – The \$750BN market that keeps growing*, *Clarus FT* ([www.clarusft.com/fx-clearing-the-750bn-market-that-keeps-growing](http://www.clarusft.com/fx-clearing-the-750bn-market-that-keeps-growing)).

The percentage of new trades being cleared centrally, which was previously stable at around 2% to 4% levels, rose sharply to 12% in the fourth quarter of 2016 (Chart 9). It continued to rise and reached 29% in the fourth quarter of 2017. Taking into account all outstanding positions at the beginning of January 2018, 24% of the total outstanding gross notional was centrally cleared.

**CHART 9**  
Percentage of cleared NDF positions



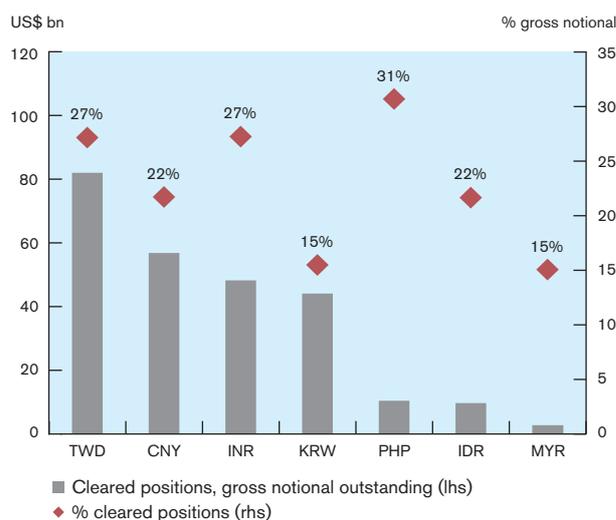
Source: HKTR.

Note: The red line refers to new trades originated in 2016–2017. The grey bar refers to outstanding positions on 5 January 2018.

Clearing is not equally common across Asian currencies. In the positions outstanding on 5 January 2018, the currencies with the largest cleared volumes were the Taiwanese dollar, the renminbi, the Indian rupee and the Korean won (Chart 10). Among these currencies, the clearing rate was 27% for the Taiwanese dollar and the Indian rupee, 22% for the

renminbi and 15% for the Korean won. The Philippine peso, the Indonesian rupiah and the Malaysian ringgit had significantly smaller cleared volumes and a range of clearing rates. The Philippine peso had the highest percentage of cleared trades among all Asian currencies at 31%.

**CHART 10**  
Cleared NDF positions by currency



Source: HKTR, 5 January 2018 positions.

One driver of the voluntary increase in central clearing of NDFs is likely to have been the implementation of reforms on margin requirements, which altered the relative prices of cleared and uncleared derivatives. Box 2 outlines how margin requirements were implemented in major jurisdictions and how, by making it more costly to hold uncleared OTC derivatives, the reform has created incentives for voluntary clearing.

**Box 2**

**How reforms on margin requirements affected the NDF market**

The years 2016–2017 saw the introduction of two new major policies in the OTC derivatives market: mandatory clearing of certain products and margin requirements on uncleared derivatives. The latter refers to the requirement that counterparties post collateral to each other in relation to derivatives that are not centrally cleared. The aim of both policies is to increase the clearing of trades through central counterparties to reduce the level of bilateral counterparty risk in the OTC derivatives market.

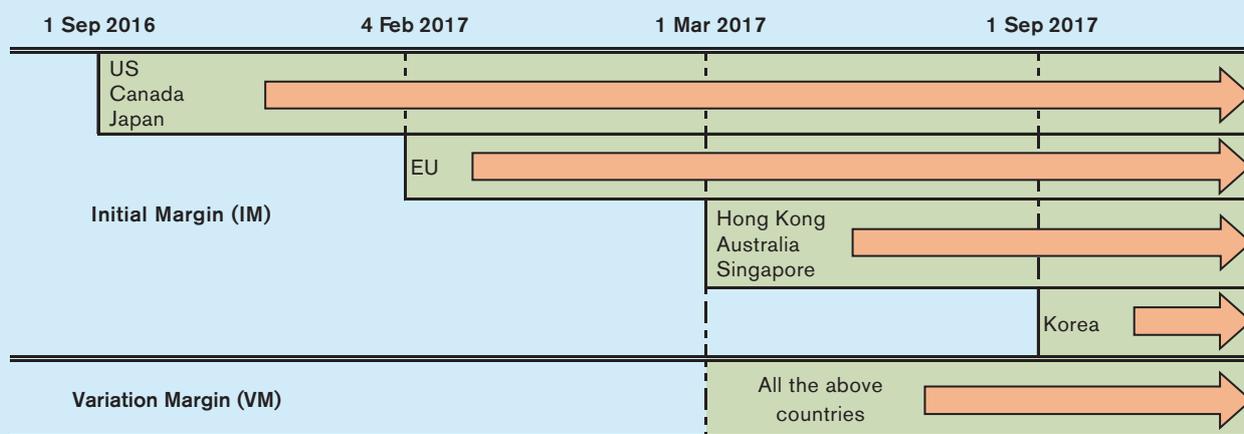
The two policies act through different channels. Mandatory clearing requires the clearing of certain products deemed liquid by regulators. Margin requirements operate through private incentives by changing the relative prices of cleared and uncleared derivatives.<sup>9</sup>

During 2016–2017, FX products were not covered by mandatory clearing in any of the major jurisdictions. Margin requirements applied instead to new OTC derivatives trades in all asset classes, with minor exclusions which did not affect NDFs.

The major jurisdictions implemented margin requirements between September 2016 and September 2017. The exact timing varied (Table 1). As a result, HKTR data for 2016–2017 included an increasing number of trades subject to margin requirements, for which the relative cost of holding an uncleared derivative would have risen, all else being equal.

**TABLE 1**

**Timeline of implementation of margin requirements in major jurisdictions**



Note: Does not include transitional arrangements applied in certain jurisdictions.

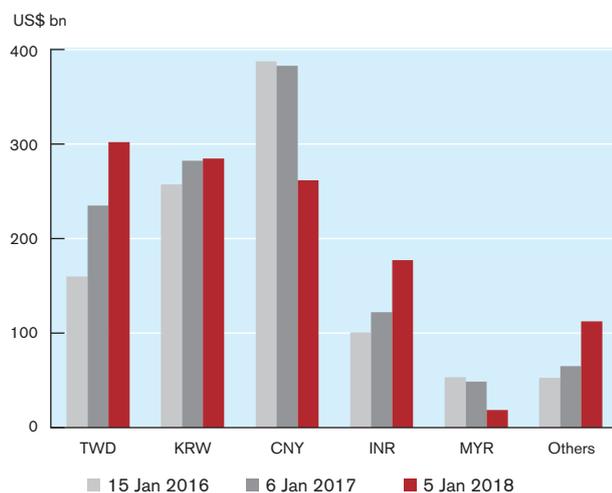
<sup>9</sup> Margin requirements have two components: an Initial Margin, posted by each party at the start of a trade to provide collateral to offset losses caused by its own potential future default, and a Variation Margin, exchanged daily as a function of the mark-to-market value of the derivative.

### b. Change in currency composition of NDFs

The 2016 BIS Triennial survey highlighted a reshuffle in the currency composition of NDFs over the period 2013–2016, with a rise in NDFs in the Korean won and the Taiwanese dollar, and a reduction in NDFs in the renminbi, which was mainly attributable to the increasing use of the deliverable forward market.<sup>10</sup>

Chart 11 plots the currency composition of NDFs as shown in the HKTR data at three points in time. The trends are consistent with the earlier trends highlighted by the BIS Triennial Survey. In January 2018, the Taiwanese dollar and the Korean won were the largest non-deliverable currencies, followed by the renminbi. While the renminbi was still the largest non-deliverable currency in 2016 as shown in the HKTR data, its use in the NDF market declined by 32% during 2017. On the other hand, the Taiwanese dollar grew by 89%, the Korean won by 11% and the Indian rupee by 76% between January 2016 and January 2018.

**CHART 11**  
Change in non-deliverable currencies



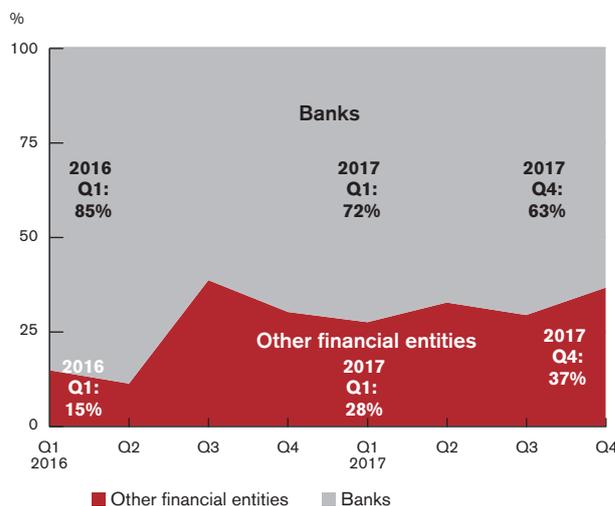
Source: HKTR, positions at 15 January 2016, 6 January 2017 and 5 January 2018.

Another development in the market is the emergence of NDFs that use deliverable currencies on both sides of the trade. While these accounted for only a negligible share of gross notional outstanding in the HKTR data for now, market reports suggest that their use is growing for risk management purposes under the newly implemented policy of margin requirements.<sup>11</sup>

### c. Shift of some NDF activities from banks to other financial institutions

The third change that took place in the market structure of NDFs over 2016–2017 was the relative decline of NDF positions by banks and the increase in positions by other financial entities. These included investment banks, asset managers, hedge funds and insurers. Among reporting entities, the relative share of banks fell from 85% in the first quarter of 2016 to 63% in the fourth quarter of 2017 (Chart 12). Correspondingly, the share of other financial entities (relative to banks) increased from 15% to 37%.

**CHART 12**  
NDF gross notional reported by banks vs other financial entities



Source: HKTR, 5 January 2018 positions.

Note: The total is the outstanding NDF gross notional reported at a point in time by banks or by other financial institutions. Excludes trades reported by other entities as well as intragroup trades. The shares are based on who reported the positions.

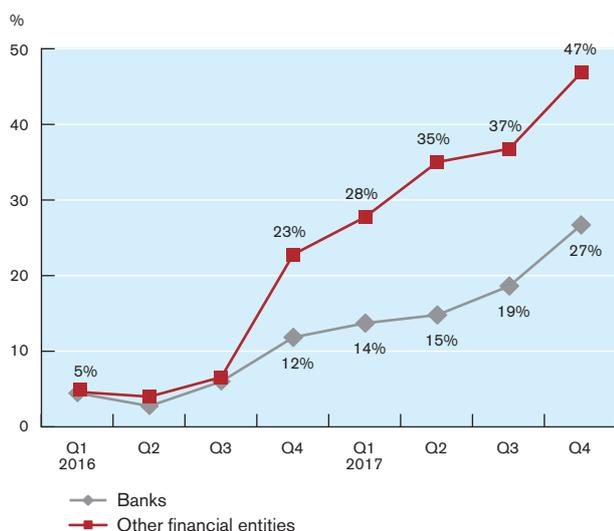
<sup>10</sup> McCauley R and C Shu (2016), “Non-deliverable forwards: impact of currency internationalisation and derivatives reform”, *Quarterly Review, Bank for International Settlements*, December ([www.bis.org/publ/qtrpdf/r\\_qt1612h.pdf](http://www.bis.org/publ/qtrpdf/r_qt1612h.pdf)).

<sup>11</sup> Chris Barnes (2017), G10 FX NDF Clearing, *Clarus FT* ([www.clarusft.com/g10-fx-ndf-clearing](http://www.clarusft.com/g10-fx-ndf-clearing)).

Non-bank financial entities contributed significantly to the increase in clearing in the NDF market. In the fourth quarter of 2017, they cleared on average 47% of their own new trades, as compared with 27% by banks (Chart 13).

CHART 13

Percentage of cleared new NDF trades by banks vs other financial entities



Source: HKTR, new trades originated in 2016–2017.

Note: Based on who reported the trades. The grey line represents the share of cleared trades reported by banks out of the total gross notional of new trades reported by banks. The red line does the same for other financial entities.

## 4. Conclusion

This article presents an analysis of the NDF market using data from the HKTR. NDF is a type of forward contracts for hedging currency risk or profiting from currency volatility, with a settlement process that makes its use attractive, in particular, for Asian and Latin American currencies.

In terms of market structure, the NDF market is mostly traded at very short maturities. The major currencies traded in Hong Kong are the Taiwanese dollar, the Korean won and the renminbi. Most of the outstanding positions are held by banks and other financial entities. While non-financial companies are less intensive users of NDFs, they are important holders of net positions in NDFs, typically to offload the currency risk from non-deliverable currencies.

Over the past two years, the NDF market experienced three major changes: a marked increase in central clearing; a change in currency composition; and increasing involvement by other financial institutions relative to banks. The magnitude and speed of the increase in voluntary clearing of NDFs are significant. Reforms on margin requirements are a plausible driver of this phenomenon. By making it more costly to hold uncleared OTC derivatives, the reform is likely to have created incentives for voluntary clearing.

### Box 3

#### Trade repositories as a data source

The data used for this article are from the HKTR, the trade repository for OTC derivatives set up in Hong Kong as part of the framework for mandatory reporting of OTC derivatives.

Trade repository data are effectively a form of “big data” on banks and other entities operating in the OTC derivatives market. Data are collected continuously from reporting entities on trades and positions in the various OTC derivative products subject to mandatory reporting. The large volume of data requires suitable analytical methods for detailed examination.

Exploiting this new source of data allows regulators to analyse the data in a flexible way, test hypotheses and map concentrations and interconnections.