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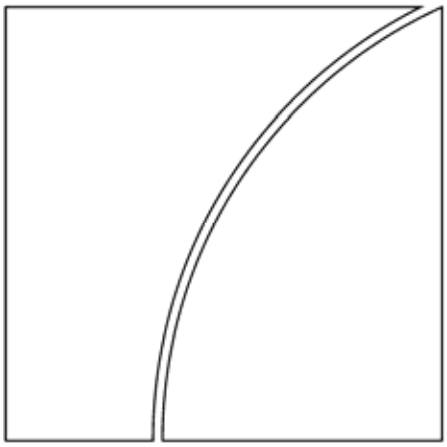

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The evolution of trading activity in Asian foreign exchange markets

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Abstract

The development of Asian foreign exchange markets has progressed appreciably in recent years. Data from the BIS Triennial Central Bank Survey indicate that the turnover of Asian currencies rose sharply between 2004 and 2007, financial institutions became more important customers, and the participation of non-residents increased. Notwithstanding this progress, the liquidity of Asian foreign exchange markets continues to be undermined by foreign exchange controls. For Asian currencies other than HKD and SGD, non-residents account for a relatively small share of activity and FX swap markets are still in their infancy. Offshore non-deliverable markets have developed in response to controls, causing trading activity to fragment. Furthermore, Herstatt risk remains high in Asian foreign exchange markets. Almost all transactions between Asian currencies are executed via the US dollar so, for those trades not cleared through CLS Bank, each leg is settled at significantly different times.

JEL Classification Numbers: F31, G12, G15, N25, O24.

Keywords: Foreign exchange, trading volume, currency controls.

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1. Introduction

The depth and breadth of Asian foreign exchange markets have improved markedly in recent years. Volumes grew rapidly and the diversity of market participants increased. Activity in Asian currencies remained concentrated in onshore markets to a much greater degree than that in major currencies, indicating that foreign exchange controls are having the intended effect of stalling the internationalisation of Asian currencies. At the same time, foreign exchange controls appear to be restraining the development of Asian foreign exchange markets by depressing derivatives trading and fragmenting activity between on- and offshore markets.

The development of foreign exchange markets is closely linked to the participation of foreign investors in local bond markets. The absence of a liquid derivatives market in which to hedge currency risk might deter foreign investment in local currency bonds and, therefore, limit the diversity of bond market participants. Managers of multi-currency bond portfolios typically prefer to hedge the associated currency risk because the volatility of currency returns is greater than the volatility of most bond returns; open currency positions are usually found to add volatility to bond portfolios without adding much return (Ramaswamy and Scott (2005)). This contrasts with equity portfolios, where the case for hedging is less convincing because the volatility of equity returns is much higher. The link between foreign participation in equity markets and the development of foreign exchange markets is correspondingly weaker.

Whereas much has been written about the development of local bond markets in Asia since the financial crisis of 1997, the development of foreign exchange markets has received less attention.[3] There is a growing literature on the microstructure of foreign exchange markets, surveyed in Lyons (2001) and Sager and Taylor (2006). However, most empirical work focuses on widely traded currency pairs, in particular euro-US dollar and US dollar-yen. The microstructure of markets for thinly traded currencies from emerging markets is not as well researched. One area that has received some attention is the impact of central bank intervention on the level and volatility of emerging market currencies, reviewed in Disyatat and Galati (2005). Another area is the institutional setting in which foreign exchange trading takes place. Based on a survey of foreign exchange markets in developing and transition

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[1] A Japanese-language version of this publication is available on the website of the Bank of Japan www.boj.or.jp.

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[3] For a review of the development of bond markets in Asia, see BIS (2006a) and BIS (2006b).

economies, Canales-Kriljenko (2004) concludes that foreign exchange regulations and the role of the central bank heavily influence the structure of the market. Ho, Ma and McCauley (2005) analyse factors that influence the trading and pricing of Asian currencies. Ho, Ma and McCauley (2004) and Debelle, Gyntelberg and Plumb (2006) examine forward currency markets in Asia.

Building on these latter studies, we analyse the institutional structure of Asian foreign exchange markets. We examine the factors behind the recent growth of trading volumes (section 3), the types of participants active in the market (section 4), the choice of vehicle currency (section 5), the location of trades (section 6) and the kinds of instruments traded (section 7). We take a comparative approach: the turnover of 10 currencies from non-Japan Asia – Chinese renminbi (CNY), Hong Kong dollar (HKD), Indian rupee (INR), Indonesia rupiah (IDR), Korean won (KRW), Malaysian ringgit (MYR), Philippine peso (PHP), Singapore dollar (SGD), Thai baht (THB) and New Taiwan dollar (TWD) – is contrasted with the turnover of seven widely traded currencies – Australian dollar (AUD), Canadian dollar (CAD), euro (EUR), Japanese yen (JPY), New Zealand dollar (NZD), pound sterling (GBP) and US dollar (USD). For convenience, we refer to this latter group as "internationalised" currencies. An internationalised currency is one that can be exchanged freely for other currencies and used to denominate debt and other contracts outside its country of issue (McCauley (2006)). Of the 10 currencies from non-Japan Asia that we consider, two – HKD and SGD – can be considered internationalised currencies; however, for purposes of comparison, we group them with Asian currencies.

Our analysis relies mainly on turnover data from the BIS Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity (section 2). Average daily turnover captures the order flow a market typically accommodates so can be interpreted as a measure of the depth of the market (CGFS (2000)). Depth, in turn, is a key dimension of market liquidity. In general, markets with high turnover trade at tighter bid-ask spreads and are more resilient, in the sense of being less prone to imbalances in buy and sell orders. Order flow is also an important means of transmitting information relevant to the determination of exchange rates (Lyons (2001)). However, in this study we do not consider the price impact of order flow. We focus on turnover to the exclusion of prices and consequently provide an incomplete picture of the structure of Asian foreign exchange markets. That said, we describe the institutional setting in more detail than previous studies by exploiting turnover data not previously published by the BIS, distinguishing in particular between on- and offshore trading by different counterparties and in different instruments.

2. BIS Triennial Central Bank Survey

The BIS Triennial Central Bank Survey is the most comprehensive source of information on activity in global foreign exchange markets. It covers foreign exchange turnover in both spot and over-the-counter (OTC) derivatives markets.[4] Over 1200 dealers in 54 countries and jurisdictions participated in the 2007 survey. The data are collected by central banks and monetary authorities, and global aggregates are then compiled by the BIS.

In the triennial survey, turnover is defined as the gross nominal volume of transactions. Volumes are recorded on a two-way basis, meaning that sales and purchases are summed, and transactions via a vehicle currency are reported as two separate deals. Dealers are asked to report all transactions during the month of April. Since transactions between two

[4] The Triennial Central Bank Survey also covers notional amounts outstanding and activity in interest rate derivatives markets. The Survey's findings and methodology are discussed in detail in BIS (2007).

dealers are reported twice (once by each dealer), the gross data for inter-dealer trading are divided by two to eliminate double-counting.

Various details of a trade are reported, including: instrument (five types), currency (eight pairs), counterparty (three categories) and location (over fifty jurisdictions). Table 1 summarises these breakdowns. In addition, dealers are asked to distinguish between local trades (with residents) and cross-border trades (with non-residents). This facilitates the separation of turnover into onshore and offshore trading. A trade is categorised as onshore if it involves a dealer residing inside the currency's country of issue; all other trades are considered offshore.[5] An alternative distinction is between domestic and international trades. A trade is international if at least one of the counterparties does not reside in the currency's country of issue. Table 2 illustrates the different ways in which turnover can be disaggregated by location.

The BIS has coordinated surveys of foreign exchange market activity every three years since 1986. The number of participating countries expanded from 4 in 1986 to 43 in 1998 and 54 in 2007. Dealers in many Asian markets joined the reporting population only in 1998 and, therefore, we focus on data from the 1998, 2001, 2004 and 2007 surveys. The reporting guidelines changed between some surveys. For example, the location of trades was based on the trading desk in the 1998 and 2001 surveys and the sales desk in the 2004 and 2007 surveys. Nevertheless, according to BIS (2005, p 27), the data are "fairly comparable" across surveys.

The triennial survey's coverage of foreign exchange activity is incomplete because not all countries participate in it and, within reporting countries, some transactions may be missed. At the global level, the gap appears to be small. BIS (2007) estimates that the "true" total global turnover is 2-6% higher than the turnover reported in the 1998-2007 surveys. For some currencies, however, the gap might be much larger. Ho, Ma and McCauley (2005) estimate that, in 2004, the true turnover of CNY might be twice as high as the reported turnover because the survey did not capture onshore transactions between Chinese dealers and many non-bank customers.[6]

For most Asian currencies, coverage is lowest for offshore trading. The 1998 survey captured only onshore trading. The 2001 survey asked dealers in all markets to report transactions in individual Asian currencies, but a few large international financial centres did not provide a complete breakdown. Coverage of offshore trading improved noticeably in the 2004 and 2007 surveys. However, the United Kingdom reported turnover in only HKD and SGD separately. Our best estimate is that the turnover of Asian currencies was underreported by about 15% in 1998 and 5% in 2007.

Another cause of underestimation is "overnetting" of interdealer turnover. If there are any discrepancies between the interdealer transactions reported by one dealer and those reported by dealers on the other side of a trade, then the adjustment for interdealer double-counting might be too large (BIS (2007, p 46)). We partially correct for overnetting by assuming that cross-border interdealer turnover in each individual currency is no smaller

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[5] This categorisation is based on the residency of dealers. An alternative basis for distinguishing between onshore and offshore trades is the residency of counterparties. In this case, onshore trades would be those in which at least one of the two counterparties is a resident of the currency's country of issue. Dealers do not report a detailed geographical breakdown of counterparties, so if the categorisation is based on the residency of counterparties then the triennial survey data will overestimate the proportion of offshore trading. In particular, cross-border trades with customers (excluding other dealers) residing inside the currency's country of issue are indistinguishable from cross-border trades with customers residing elsewhere.

[6] The turnover data reported by the Chinese authorities covered only trades among members of the China Foreign Exchange Trade System, membership of which is limited to financial institutions and a few non-financial companies.

than turnover reported by onshore dealers.[7] This correction boosts turnover significantly in a few cases. For example, the correction for overnetting boosts HKD turnover by almost 20% in 2007.

Finally, our aggregate estimates include the turnover of "new" as well as "traditional" foreign exchange instruments. The foreign exchange turnover data published by the BIS typically refer to traditional instruments: spot, outright forwards and foreign exchange (FX) swaps. To these we add the turnover of other, newer OTC instruments: currency swaps and options.[8] In this study, forwards, FX swaps, currency swaps and options are grouped together as OTC derivatives.

Foreign exchange turnover statistics are available at a higher frequency than triennially from market and national sources. Market participants in the United Kingdom and the United States began to contribute to semi-annual surveys of foreign exchange market activity in October 2004. Canada, Japan and Singapore later launched similar surveys.[9] India, New Zealand and Taiwan (China), among other jurisdictions, also publish monthly or even daily data covering onshore trading of the domestic currency. Owing to their different reporting methodology, these surveys are not directly comparable to the triennial survey. Nevertheless, they can provide supplementary information about developments in foreign exchange markets. For our purposes, the Tokyo survey is especially useful because it is the only survey, other than the triennial one, to provide turnover details for each Asian currency separately.

3. Turnover by year: rapid growth of activity

Trading activity in Asian currency markets has increased tremendously in recent years. The turnover of the 10 Asian currencies combined rose from $100 billion per day in April 2004 to $249 billion per day in April 2007 (Graph 1 and Table 3). This represents a sharp acceleration in growth, from 50% between 2001 and 2004 to 130% between 2004 and 2007 (after controlling for exchange rate movements).[10] Moreover, in the three years to April 2007 the turnover of Asian currencies grew twice as fast as global turnover in foreign exchange markets.

Although the turnover of each of the 10 Asian currencies increased between April 2004 and April 2007, there were marked differences in growth rates. Trading volumes for CNY increased more than sevenfold, from $2 billion in 2004 to $15 billion in 2007 (Table 3). At the other extreme, trading volumes for KRW increased by only 41% (after controlling for exchange rate movements), from $22 billion to $39 billion. HKD remained the most actively traded currency, accounting for 40% of total Asian turnover and exceeding the combined turnover of the second and third most actively traded currencies, SGD and KRW. IDR, MYR

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[7] In other words, cross-border interdealer turnover is calculated as the maximum of "net-gross" turnover reported by onshore dealers and "net-net" turnover reported by all dealers.

[8] The turnover of options is measured as the sum of options bought and sold.

[9] In Canada and Singapore the first such survey was in October 2005 and in Japan April 2006.

[10] Turnover is reported in USD at the exchange rate prevailing on the day of the transaction. To control for exchange rate movements between surveys, we first convert USD volumes into local currencies, for example CNY/USD turnover into CNY, at the average exchange rate during the survey month. We then reconvert local-currency volumes into USD at the April 2007 exchange rate. Asian currencies appreciated against the USD between 2004 and 2007; therefore, reported volumes overestimate the growth of turnover.

and PHP were the least traded, at around $4 billion each. Nevertheless, for the latter two currencies this represented a nearly fourfold increase over turnover in April 2004.

Galati and Heath (2007) attribute the growth in global foreign exchange turnover to increased trade in financial assets. Investors with longer term investment horizons continued to diversify their portfolios by investing in foreign bonds and equities. At the same time, leveraged investors, with relatively short investment horizons, were attracted to foreign exchange markets by the potential returns on carry trades. An increase in high-frequency, algorithmic trading by some investors, mostly investment banks, also lifted foreign exchange turnover, particularly in the spot market.[11]

These same factors were undoubtedly responsible for part of the increase in the turnover of Asian currencies, although their relative importance was less than was the case for the major currency pairs. Certainly algorithmic trading had a much smaller impact on Asian currencies than on internationalised currencies (Wright (2007)). Foreign investment both to and from Asia has increased sharply since 2002, in the process creating direct and indirect demand for foreign exchange. The IMF estimates that in 2007 inflows to the region totalled about $650 billion and outflows $500 billion, for a combined total of $1150 billion (Graph 1). By contrast, in 2004 inflows and outflows summed to less than $500 billion. In addition to foreign direct investment, portfolio investment increased, including purchases of local-currency debt securities. Leveraged trades concentrated in IDR, INR and PHP, which were popular target currencies over this period (Gyntelberg and Remolona (2007)).

Inflows to Asian equity markets made an especially large contribution to foreign exchange turnover in April 2007. The survey month coincided with a region-wide rally in equity prices and substantial purchases of Asian equities by non-residents. The turnover of HKD in particular was likely given a temporary boost by the large amount raised through offerings on the Hong Kong Stock Exchange in April 2007.

Trade in goods and services was also an important driver of Asian currencies' turnover, certainly more so than for internationalised currencies. As can be seen in Graph 1, turnover follows Asian economies' trade flows more closely than it does their capital flows. Gross trade flows (imports plus exports) for the 10 Asian economies increased from $4.3 trillion in 2004 to an estimated $7 trillion in 2007. Countries with the fastest growth in trade, in particular China and India, also tended to experience fast growth in foreign exchange turnover.

An additional factor behind the growth of Asian currencies' turnover was an increase in exchange rate volatility. Providing that market conditions remain orderly (ie prices are not prone to excessive gapping), higher volatility can boost trading activity by increasing arbitrage opportunities and hedging demands. Authorities in China and Malaysia adopted more flexible exchange rate regimes in July 2005. In India and the Philippines in 2007, the authorities acquiesced to larger daily moves in exchange rates than they had in previous years. Indeed, in April 2007 INR appreciated against the USD at a record pace.

Although growing fast, the combined turnover of Asian currencies is still only a small fraction of global turnover. In April 2007, Asian currencies' share of global turnover was slightly larger than AUD's share, 7.5% versus 6.6%, but well below JPY's 17.2% share. In absolute terms, turnover totalled $249 billion for the 10 Asian currencies, $220 billion for AUD and $573

[11] Algorithmic trading uses automated routines to initiate orders. In foreign exchange markets, algorithmic strategies typically focus on taking advantage of small pricing anomalies. The volumes traded are often large but the positions are usually not held for very long, often minutes or even seconds. Algorithmic trading is closely linked to electronic trading because the former relies on the lower transactions costs and trade execution times made possible by the latter.

billion for JPY. USD was the most actively traded currency in the world, with volumes in excess of $2.8 trillion per day, followed by EUR at $1.2 trillion.

More significantly, the turnover of Asian currencies is low relative to underlying economic activity. For the world as a whole, turnover in foreign exchange markets is about 30 times greater than trade in goods and services (Graph 2). Among Asian currencies, only HKD exceeds the global average; all other Asian currencies are well below the average. The ratio of foreign exchange turnover to trade flows is lowest for CNY, at around 2. These low ratios confirm that activity in Asian currency markets is driven predominantly by trade in goods and services. Among internationalised currencies, the ratio of foreign exchange turnover to trade flows greatly exceeds the global average: for example, it tops 250 for NZD. This indicates that a high proportion of turnover in internationalised currencies is generated by trade in financial assets.

4. Turnover by counterparty: large share of interdealer activity

Trade in goods and services may still generate more activity in Asian currency markets than trade in financial assets, but transactions between reporting dealers and non-financial customers such as exporters and importers are growing more slowly than transactions between dealers and financial customers such as fund managers and insurance companies. Financial customers' share of total turnover rose by about 10 percentage points between 1998 and 2007, to 27%, while non-financial customers' share declined to 16% (Graph 3). Interdealer activity remained high and stable at 57% of Asian currencies' turnover.

That said, the balance of turnover in Asian currencies is shifting towards asset-related transactions at a much more gradual pace than that of internationalised currencies. In 1998, transactions with financial customers accounted for a similar share of turnover in Asian currencies as in internationalised currencies: around 17% (Graph 3). In 2007, that share had increased to 41% for internationalised currencies but only 27% for Asian currencies. With the possible exception of CNY, the share of transactions with financial customers is lower for every Asian currency than for any internationalised currency (Graph 4).[12] Among Asian currencies, the share is highest in MYR, at 37%, and lowest in INR, at 17%. Among internationalised currencies, the share is highest in CAD, at 45%, and lowest in NZD, at 38%.

An important explanation for Asian currencies' relatively small share of trading with financial customers is Asia's low degree of capital mobility. Following Miniane (2004), we compile an index of capital account restrictions based on 1/0 dummy variables published in the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions*, where a value of one indicates the existence of restrictions. The index averages 0.4 for the sample of currencies for which the ratio of foreign exchange turnover to trade flows is above the global average, and 0.8 for those for which the ratio is below. In other words, foreign exchange turnover is higher in countries with open capital accounts. This is not surprising, considering that low barriers to inward and outward investment facilitate the international diversification of portfolios.

The structure of the local financial system also influences the relative importance of different market participants. In particular, it skews the distribution of activity towards transactions between dealers. Banks in a few Asian jurisdictions rely on foreign exchange markets for

[12] In CNY, transactions with financial customers account for 41% of reported turnover. This is likely an overestimate because it is based on turnover on the China Foreign Exchange Trade System, which is open only to members, most of whom are financial institutions. See the discussion in section 2.

short-term funding to a greater extent than banks in some other financial systems.[13] In particular, the local affiliates of foreign banks often find FX swaps to be a more attractive vehicle for raising local currency financing than interbank loans. One indication of the importance of the FX swap market as a source of interbank funding is the use of swap-implied rates as the reference rate in interest rate swap (IRS) contracts instead of interbank rate fixings as used in USD, EUR and JPY markets. The floating rate leg of SGD, THB and PHP IRSs is linked to the interest rate implied by FX swaps (Gyntelberg and Wooldridge (2008)).

Another feature of some Asian financial systems likely to boost the share of interdealer trading is the regulation of foreign exchange activity. In some Asian countries, sales and purchases of foreign exchange are subject to stringent controls (see section 6). This adds to the difficulties dealers face in finding counterparties with whom to hedge or close out their positions. Considering that dealers typically trade open positions amongst themselves until a customer willing to take the opposite side is found, one potential consequence of foreign exchange controls is that customer transactions generate more interdealer activity than in markets without such controls.[14]

Notably, interdealer activity has remained stable in Asian markets even while it has declined elsewhere. Among internationalised currencies interdealer transactions fell from 67% of total turnover in April 1998 to 42% in April 2007 (Graph 3). By contrast, among Asian currencies interdealer activity was unchanged over the same period, at around 56%. The FX swap market is an especially important source of interbank funding for HKD and SGD. This explains why interdealer activity is so high in these two currencies: 66% and 60%, respectively (Graph 4). For PHP and THB too, forwards and FX swaps are extensively used as vehicles for bank funding. For other Asian currencies, foreign exchange controls arguably contributed to the high share of interdealer activity.

What makes the high and stable share of interdealer activity especially noteworthy is that those factors which contributed to the relatively slow growth of turnover in the interdealer segment of internationalised currency markets were also present in Asian markets. Galati (2001) identifies consolidation in the banking industry and the expansion of electronic trading as key restraints on global interdealer activity. Greater concentration of order flows with a few dealers results in an increase in the proportion of trades crossed internally. It also raises the probability of transacting with an informed trader in the interdealer segment, thereby deterring trading. In Asian markets as elsewhere, the number of active foreign exchange dealers declined, especially between 1998 and 2001. On average across the 10 Asian markets, the number of dealers covering 75% of turnover fell from 16 in 1998 to 13 in 2001 and 11 in 2007.

Electronic broking and trading also tend to depress interdealer activity. By increasing transparency, they simplify price discovery and, therefore, reduce dealers' incentive to seek information from other dealers by engaging in multiple transactions. The penetration of electronic platforms varies significantly across markets, and Asian markets are no less heterogeneous than those elsewhere (Graph 5). The proportion of interdealer transactions conducted through either an electronic broker or a multi-dealer platform ranges from 58% to

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[13] FX swaps are similar to collateralised loans because obligations in one currency are secured against assets in the other currency (Baba, Packer and Nagano (2008)). In markets free of capital controls, FX swaps do not result in a net demand for foreign exchange because they bundle together two offsetting transactions. Instead, they influence (short-term) interest rate differentials.

[14] A high ratio of interdealer to customer trades does not necessarily imply a higher overall level of activity. If dealers have difficulty finding counterparties with whom to offset their positions, they are less likely to make a market in the first place (see section 6).

4% in Asia. Customer trades are less likely to be conducted through an electronic platform, but again there is substantial dispersion.

In summary, the impact of banking sector consolidation and electronic trading on the turnover of Asian currencies was counteracted by the rapid growth of transactions related to interbank funding. As a result the interdealer segment of Asian currency markets remained by far the largest. By contrast, among internationalised currencies, interdealer turnover has steadily declined in relative importance and, in 2007, was close to being surpassed by trading with financial customers. Transactions with non-financial customers accounted for a similar proportion of turnover among Asian currencies as among internationalised currencies: around 17%.

5. Turnover by currency pair: USD as a vehicle currency

The rapid growth of turnover and increase in intra-regional trade and investment flows has not lessened the pre-eminence of USD crosses in the trading of Asian currencies. USD was on one side of about 97% of all transactions involving Asian currencies in April 2007 (Table 4 and Graph 6). This share was unchanged from previous surveys. In short, turnover data give no indication of a decline in the use of USD as a vehicle currency among Asian currencies.

A vehicle currency is an international medium of exchange. It is the currency through which transactions between other currencies are settled. Currencies which are used as a vehicle are typically those with the lowest transaction costs. Provided that transaction costs are a decreasing function of the volume of transactions, the cost of trading two currencies directly is likely to be greater than the cost of transacting indirectly through a large third currency market (Krugman (1980), Hartman (1998), Rey (2001)).[15]

Among Asian currencies, the proportion of transactions against currencies other than USD is small and stable. For all currencies except the major ones, turnover by currency pair is available only for onshore trading.[16] To the extent that these data are representative of total turnover, they indicate that the importance of non-USD trades ranges from 7% of IDR and THB turnover to 1% of HKD and PHP turnover (Graph 6). By contrast, 28% of EUR trades, 21% of JPY trades and 10% of AUD trades are against currencies other than the USD. IDR, SGD and THB are the only Asian currencies to have seen the share of non-USD transactions increase perceptibly, from 2% in 2001 to around 7% in 2007.

Among Asian currencies, the volume of transactions against JPY is about the same as against EUR. Relative to total turnover, direct trades against JPY are highest for THB at 4%, while trades against EUR are highest for IDR at 3% (Table 4). However, in terms of volume,

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[15] Currencies of countries with extensive international trade links are the leading contenders to become vehicle currencies because a significant volume of trade-related transactions is likely to be settled in the local currency. Size, however, is not the only important determinant. Macroeconomic stability also matters because it promotes a currency's use as a monetary anchor (Devereux et al (2004)). Industry structure too can influence the choice of currency in which to invoice transactions (McKinnon (1979)). High value added products tend to be priced in local currency, in contrast to commodities and basic manufactures where there are many sources of supply and so one global (USD) price. Furthermore, history and network externalities have a role. Liquidity tends to be self-reinforcing, so once a currency establishes itself as the dominant vehicle it can continue to have the lowest transaction costs even after underlying economic conditions have changed.

[16] Dealers report the turnover of the local currency against each of eight major currencies (AUD, CAD, CHF, EUR, GBP, JPY, SEK and USD) but do not break down the turnover of other currencies. For example, they report the turnover of each Asian currency against all others grouped together. Therefore, for currencies traded mainly offshore, turnover unallocated by currency pair can exceed allocated turnover. Asian currencies are traded mostly onshore so onshore trading is likely to be representative of total trading.

direct trades between KRW and JPY clearly stand out, averaging $0.7 billion per day in April 2007.

HKD is the only Asian currency with sizable volumes against currencies other than the eight explicitly identified in the survey. Transactions vis-à-vis "other currencies" exceeded $1 billion per day in April 2007 (Table 4). Most of these deals likely involved CNY. The Chinese authorities authorised banks in Hong Kong to conduct a limited range of CNY banking business starting in early 2004.[17] This might have contributed to a pick up in direct trading between HKD and CNY.

Direct trades between Asian currencies and JPY, EUR and other currencies excluding USD tend to be customer trades. Transactions with customers accounted for 85% of turnover in non-USD crosses on average in April 2007, whereas they accounted for only 41% of turnover in USD crosses. Indeed, interdealer trading is almost exclusively conducted through USD. Dealers who receive an order from a customer, for example to buy JPY against THB, would likely offset the order in the interdealer market by engaging in two separate transactions, in this case buying USD against THB and JPY against USD. SGD is the only Asian currency for which trades against currencies other than USD account for a noticeable proportion of interdealer activity: 5% versus 0% to 1% for all other currencies.

The overwhelming use of USD as a vehicle currency heightens the vulnerability of Asian currencies to settlement risk. Specifically, it leaves transactions vulnerable to Herstatt risk arising from the settlement of opposing legs in different time zones. Each leg of a foreign exchange transaction is typically settled in the currency's country of issue, through the local payment system. There is limited overlap in different systems' operating hours so one currency might have to be paid before receipt of the other currency can be confirmed. This can result in sizable, temporary counterparty exposures.[18] Herstatt risk is of particular concern for transactions between Asian currencies and USD because of the large time difference between Asian financial centres and New York. A study by the Executives' Meeting of East Asia-Pacific (EMEAP) central banks found that the duration of settlement exposures is shortest for foreign exchange transactions among Asian currencies and longest for those involving a purchase of USD (EMEAP (2001)).

The launch of the Continuous Linked Settlement (CLS) system in 2002 all but eliminated the principal risk associated with foreign exchange transactions (Galati (2002)). However, only three Asian currencies can be settled through CLS Bank: SGD was added in 2003 and HKD and KRW in 2004.[19] For those foreign exchange transactions not settled through CLS Bank, other initiatives have helped to reduce settlement risk. These include improvements in banks' management of settlement risk exposures and the use of bilateral netting arrangements. In addition, Hong Kong introduced a USD real-time gross settlement (RTGS) system in 2000 and a EUR RTGS system in 2003. They replicate, and are linked to, the HKD RTGS system, thereby facilitating payment-versus-payment for HKD-USD and HKD-EUR transactions. Malaysia linked its MYR RTGS system to Hong Kong's USD RTGS system in November

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[17] CNY business in Hong Kong was at first limited to deposits by individuals, remittances to bank accounts under the same name on the mainland, debit and credit cards, and currency exchange for individuals and designated business customers. The scope of business was broadened in November 2005 to include deposits from designated businesses and CNY chequing accounts. Also, the transaction limit on currency exchange and remittances was relaxed and the limit on credit cards was removed.

[18] Other factors which contribute to settlement risk include the risk management practices of individual dealers and correspondent banking arrangements.

[19] The addition of HKD and KRW in 2004 brought the number of currencies eligible to be settled through CLS Bank to 15. The other CLS currencies are: AUD, CAD, CHF, DKK, EUR, GBP, JPY, NZD, NOK, SEK, USD and ZAR.

2006, and in 2007 about 60% of MYR-USD trades in Kuala Lumpur were settled simultaneously through the two systems (Bank Negara Malaysia (2008)).

Another possible way to reduce settlement risk in Asian foreign exchange markets is through greater use of a regional currency in intra-regional transactions in place of USD.[20] Europe is an example of what could occur in Asia. Starting in the 1980s, the Deutschmark (DEM) gradually displaced the USD in transactions between members of the European Union. In 1995, about 30% of turnover in euro legacy currencies (excluding DEM) involved DEM on one side. While USD retained its dominant place in global markets, within European markets DEM acquired an important role as a vehicle currency. In Asia, there are some signs of a movement in this direction. For example, ATM systems in Indonesia, Malaysia, Singapore and Thailand were linked bilaterally in 2005-06 as part of the e-ASEAN project. Foreign exchange transactions between the systems are now settled in local currency directly, with no role for USD. While the volume of such transactions is small, an Asian currency could yet displace the USD in intra-regional transactions if economic and financial integration within Asia continues to progress. Another development which could reduce transactions costs and thereby encourage direct trading of Asian currencies is the expansion of electronic trading.

6. Turnover by location: low participation by non-residents

An important way in which the trading of Asian currencies differs from that of internationalised currencies is in the participation of non-residents. Asian currencies are predominantly traded onshore between residents, whereas internationalised currencies are mostly traded offshore between non-residents (Graph 7). That said, the participation of non-residents has increased in recent surveys, from 47% of Asian currencies' total turnover in 2004 to 51% in 2007 (Graph 8).[21]

While there are many factors that influence the participation of non-residents in foreign exchange markets, one key factor is foreign exchange controls. Foreign exchange controls are regulations governing the buying and selling of the local currency. They are distinct from capital controls, which regulate cross-border transactions in financial assets. The two tend to be liberalised together. However, it is not uncommon for countries to remove all foreign exchange controls and maintain some restrictions on inward or outward investment.

Foreign exchange controls are usually intended to minimise opportunities for speculation. This might be done by requiring central bank approval for the sale and purchase of foreign exchange not related to an underlying current or financial account transaction. Such requirements are ordinarily accompanied by restrictions designed to suppress offshore trading because it is more difficult to monitor than onshore trading. This is typically done by making it difficult to settle offshore transactions through the accounts of an affiliate or correspondent bank located onshore: in other words, by restricting the cross-border deliverability of a currency. Among Asian currencies, HKD and SGD are the only ones not subject to exchange controls. Annex A summarises restrictions on sales and purchases of Asian currencies. In general, controls are looser for transactions between residents than those between residents and non-residents. Also, controls are looser for spot transactions than for derivatives.

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[20] This would not eliminate settlement risk. The extent to which the use of a regional currency reduces settlement risk depends crucially on the risk management measures in place in the local payment system.

[21] As discussed in section 2, offshore trading of Asian currencies was not surveyed in 1998 and only partially surveyed in 2001.

To the extent that foreign exchange controls are designed to restrict the offshore trading of Asian currencies, they are clearly having the intended impact. The onshore share of spot trading is about twice as high for Asian currencies as for internationalised currencies. In April 2007, onshore turnover exceeded 70% of spot trading for all Asian currencies except HKD (Graph 9). The onshore share of derivatives trading was more varied; nevertheless, in general it too exceeded the onshore share of derivatives trading in internationalised currencies.

A perhaps less intended consequence of foreign exchange controls is that they also limit the participation of non-residents in onshore markets. Transactions with non-residents account for about 25% of onshore trading in Asian currencies but over 50% of onshore trading in internationalised currencies (Graph 10). Non-resident participation in onshore markets is highest for HKD and SGD and lowest for CNY, where it is prohibited. Figures are similar for spot and derivatives trading.

In several markets, changes in foreign exchange controls had a marked impact on non-resident participation between 2004 and 2007. Malaysia liberalised its foreign exchange administration rules in April 2005 and this, together with the removal of many capital controls at the same time, lifted non-resident participation substantially between April 2004 and April 2007 (Graph 8). Thailand, on the other hand, imposed additional controls in December 2006, including unremunerated reserve requirements on short-term inflows and time limits on the conversion of local-currency payments into foreign exchange.[22] As a result, the participation of non-residents fell noticeably. Non-residents' share of spot trading fell especially sharply. In Indonesia, the introduction of a regulation in July 2005 requiring supporting documentation from non-residents wishing to purchase IDR contributed to a small decrease in non-resident participation. At the same time, non-residents shifted much of their IDR trading from onshore to offshore markets.

While easing controls on non-resident participation in onshore markets can certainly help to internationalise a currency, as shown by the experience of Malaysia, such measures do not substitute for removing controls on offshore trading. Among the currencies we examine, there is clearly a positive relationship between offshore trading and non-resident participation in onshore markets (Graph 10). It seems likely that non-residents will remain minor players in Asian foreign exchange markets so long as offshore trading is restricted.

There are a few exceptions to this pattern: non-residents are active in GBP, HKD and SGD markets even though trading is concentrated in onshore markets. This reflects the fact that London, Hong Kong and Singapore are important centres of trading for a wide range of currencies. In fact, London alone accounted for 49% of offshore trading in global foreign exchange markets in April 2007, Singapore 10% and Hong Kong 5% (Table 5). They enjoy economies of scale and attract a heterogeneous range of market participants. This gives them a significant cost advantage over other centres so there is correspondingly less of an incentive to transact offshore.

Hong Kong and Singapore are especially important centres for the trading of Asian currencies. Around half of offshore trading in Asian currencies takes place in the Asian time zone, mainly in Singapore and Hong Kong. This contrasts with the offshore trading of internationalised currencies, which is centred in London.

[22] These controls were lifted in March 2008.

7. Turnover by instrument: the fragmentation of derivatives trading

As well as impacting the participation of non-residents, foreign exchange controls influence the types of instruments traded. In particular, they discourage derivatives transactions. For the majority of Asian currencies, activity in OTC derivatives markets is around 1½ times higher than activity in the spot market (Graph 11). By contrast, for most internationalised currencies, it is two to three times higher.

The impact of foreign exchange controls is most noticeable on FX swaps. In the global foreign exchange market, the turnover of FX swaps greatly exceeds spot transactions: $1.7 trillion per day in April 2007 versus $1.0 trillion. Similarly, swap transactions in HKD and SGD are larger than spot transactions (Graph 11). Indeed, HKD and SGD swap markets are unusually large, owing mainly to the importance of the FX swaps as vehicles for interbank funding. However, among almost all other Asian currencies, the opposite is true: spot markets are larger than FX swap markets. The one exception is THB. What sets THB apart from the other eight Asian currencies subject to foreign exchange controls is its (limited) deliverability offshore (Annex A). The Bank of Thailand's use of FX swaps in monetary operations also helps to boost activity.

Unfettered foreign exchange markets ease risk management so heighten the willingness of dealers to trade FX swaps. A swap can be replicated with a spot and an offsetting forward transaction, or forward sale and purchase contracts with different maturities. If spot and forward transactions are subject to stringent controls, then it will be difficult for market makers to replicate a swap and consequently to hedge their positions. Dealers will be less willing to provide liquidity as a result. The importance of deliverability, in particular, for FX swap markets is confirmed by the fact that, for non-deliverable Asian currencies, almost all swaps are traded onshore (Graph 12).

In currency swap and option markets too, foreign exchange controls appear to depress activity by restricting offshore trading. In the global foreign exchange market, the turnover currency swaps and options as a ratio of spot trading is around 0.3. For a few Asian currencies, in particular KRW, IDR, INR and HKD, it is similarly high, but for the majority it is much lower. Furthermore, what trading there is tends to take place onshore.

Foreign exchange controls are not, of course, the only impediment to the development of derivatives markets. In some countries, prudential regulations have an equally, if not more, important impact. For example, in China foreign exchange derivatives were not permitted prior to August 2005. The relaxation of restrictions boosted onshore turnover of CNY derivatives from 0 in 2004 to about $1 billion per day in 2007. Even so, CNY derivatives continued to trade mainly in offshore markets (Graph 9).

For non-deliverable currencies, forward markets replace swap markets to some degree. In the global foreign exchange market, the turnover of FX swaps is almost five times greater than the turnover of forwards (Table 6). By contrast, among non-deliverable Asian currencies, the turnover of forwards typically exceeds that of swaps. KRW has the largest forward market, followed by INR.

Unlike swaps, forwards are traded mainly offshore (Table 6). Only for THB and KRW do a majority of forward transactions take place onshore. For all Asian currencies except HKD, SGD and THB, forwards traded offshore are mainly non-deliverable contracts. For KRW, some forwards traded onshore are also non-deliverable contracts because Korean dealers are permitted to trade such contracts with non-residents (Annex A). Although the triennial survey does not distinguish between deliverable and non-deliverable forwards (NDFs) for individual currencies, the annual Tokyo market survey does (Table 7). Not surprisingly, there is no trading of HKD, SGD or THB NDFs in Tokyo. For other Asian currencies, most (but not all) forward transactions are via NDFs. The few deliverable forwards that are traded in Tokyo are probably with counterparties residing in the currency's country of issue.

In summary, foreign exchange controls influence both the level and composition of derivatives activity. Controls are having the intended effect of limiting opportunities for speculation by restraining the growth of derivatives markets. At the same time, they are causing trading to fragment between onshore and offshore markets: FX swaps are predominantly traded onshore while non-deliverable forwards are traded offshore. Such fragmentation potentially has negative consequences for the liquidity of foreign exchange markets as well as the effectiveness of foreign exchange controls.

8. Conclusions

The development of Asian foreign exchange markets has progressed appreciably in recent years. Data from the BIS Triennial Central Bank Survey indicate that the turnover of Asian currencies rose sharply between 2004 and 2007, financial customers became more important participants, and the participation of non-residents increased. Notwithstanding this progress, the liquidity of Asian foreign exchange markets continues to be undermined by foreign exchange controls. Authorities maintain foreign exchange controls to minimise opportunities for speculation and thereby lessen the likelihood of exchange rate misalignments. This comes at the cost of slowing the development of foreign exchange markets. For Asian currencies other than HKD and SGD, non-residents account for a relatively small share of activity and FX swap markets are still in their infancy. Furthermore, offshore non-deliverable markets have developed in response to controls, causing trading activity to fragment.

In addition, settlement risk remains high in Asian foreign exchange markets. Almost all transactions between Asian currencies are executed via USD so, for those trades not cleared through CLS Bank, each leg is settled at significantly different times. Greater use of a regional currency in intra-regional transactions, in place of USD, is one of several ways in which settlement risk could be reduced, though at present there is little evidence of a significant shift in this direction.

In this study we have focussed on turnover, which captures only one dimension of liquidity. A fuller analysis of the structure of Asian foreign exchange markets would also consider prices, including bid-ask spreads, volatility and interest parity relationships. Only then can firm conclusions about the impact of foreign exchange controls on the development of foreign exchange markets and interactions between onshore and offshore markets be drawn.

The potential consequences of the underdevelopment of foreign exchange markets for other financial markets also pose important questions for future research. Possible consequences include: low foreign participation in local bond markets, owing to the absence of a liquid market in which to hedge currency risk; and underdeveloped money markets, because FX swaps and other foreign exchange instruments are commonly employed by financial institutions to raise short-term funding. These questions are especially relevant in Asia considering the efforts made since the Asian financial crisis to develop local bond markets.

Tables and graphs

Available breakdowns of foreign exchange turnover

Breakdown	Definition
By instrument	*Spot transaction*: exchange of two currencies for settlement within two business days. *Outright forward*: exchange of two currencies for settlement more than two business days later. *Foreign exchange swap*: exchange of two currencies on a specified date coupled with a reversal of the exchange at a later date. *Currency swap*: exchange of streams of interest payments in two different currencies for a specified period of time, coupled with an exchange of the principal amount at maturity. *Option*: right to buy or sell a currency against another currency at a specified exchange rate for a specified period. Instruments with embedded options are classified as options.
By currency pair	Local currency against USD, EUR, JPY, GBP, CHF, CAD, AUD, SEK and all other currencies (collectively).
By counterparty	*Reporting dealers*. *Financial customers*, including non-reporting banks, institutional investors, insurance companies and financial subsidiaries of corporations. *Non-financial customers*, including governments and corporations.
By location	Location of the sales desk involved in the trade. Even if a trade is executed or booked elsewhere, it is recorded as taking place in the jurisdiction where the sales desk is located.

Sources: BIS (2007). Table 1

Alternative definitions of turnover by location

Currency of country X		Residency of the customer	
		Country *X*	Country *Y*
Residency of the reporting dealer	Country *X*	Local Onshore Domestic	Cross-border Onshore International
	Country *Y*	Cross-border Offshore[1] International	Local Offshore International

[1] If the customer is also a reporting dealer, then the transaction is categorised as onshore. If the customer is not a reporting dealer, then the transaction is included with offshore trades because insufficient information is available to identify the residency of the customer. Table 2

Growth of foreign exchange turnover

Average daily turnover in spot and OTC derivatives markets[1]

	April 1998 (USD bns)	April 2001 (USD bns)	April 2004 (USD bns)	April 2007 (USD bns)	Growth rate[2] (%)	Share[3] (%)
All currencies[4]	1 599.9	1 265.9	2 020.4	3 453.2	63	100.0
USD	1 325.1	1 114.0	1 682.8	2 845.4	60	85.6
EUR	788.4	469.9	720.2	1 231.2	56	37.0
JPY	331.6	291.7	400.0	573.4	52	17.2
GBP	168.2	161.7	315.9	494.2	42	14.9
AUD	46.3	53.6	107.3	220.0	86	6.6
CAD	53.8	55.6	81.0	142.6	49	4.3
NZD	5.0	6.9	18.6	63.0	198	1.9
Asia (AXJ)	47.4	64.8	99.6	249.0	132	7.5
CNY	0.2	0.3	1.9	15.0	646	0.5
HKD	19.0	30.9	35.8	101.7	185	3.1
IDR	1.2	0.6	2.2	3.7	78	0.1
INR	1.4	2.9	6.3	23.6	263	0.7
KRW	2.3	10.0	22.1	38.6	41	1.2
MYR	0.7	0.9	1.0	4.4	289	0.1
PHP	0.5	0.5	0.8	3.5	287	0.1
SGD	17.7	13.5	17.5	39.9	105	1.2
THB	2.6	1.9	3.9	6.5	50	0.2
TWD	1.8	3.4	8.1	12.1	50	0.4
Memo: AXJ_{2007}[5]	49.5	72.8	107.5	249.0	132	--

[1] Specified currency against all other currencies; adjusted for local and cross-border inter-dealer double counting; data might differ from published BIS data because of differences in aggregation procedures. [2] Percentage change in turnover between April 2004 and April 2007, at April 2007 exchange rates. [3] As a percentage of turnover in all currencies, in April 2007. [4] The sum of transactions in individual currencies equals twice the total turnover because two currencies are involved in each transaction; adjusted for estimated gaps in reporting. [5] Turnover of Asian currencies at April 2007 exchange rates.

Sources: BIS (Tables E.1 and E.20); authors' calculations. Table 3

Foreign exchange turnover by currency pair

Estimated from turnover allocated by currency pair[1]

	Average daily turnover, in billions of USD				Pair's share of allocated turnover[2]	Unallocated share of total turnover[3]
	1998	2001	2004	2007		
USD / Asia[4]	45.3	63.5	95.8	241.5	97	30
USD / HKD	17.7	30.5	34.3	100.4	99	27
USD / SGD	17.3	13.2	16.8	37.6	94	37
USD / KRW	2.2	9.9	21.6	37.0	96	25
USD / INR	1.3	2.7	6.0	22.6	96	23
USD / CNY	0.2	0.3	1.8	15.0	100	40
USD / TWD	1.6	3.2	7.8	11.5	95	44
USD / THB	2.6	1.8	3.6	6.0	93	26
USD / MYR	0.6	0.9	1.0	4.3	97	38
USD / PHP	0.5	0.5	0.8	3.5	99	38
USD / IDR	1.2	0.6	2.1	3.4	93	44
EUR / Asia[4]	0.1	0.2	0.6	1.8	1	--
EUR / KRW	< 0.1	< 0.1	0.2	0.6	2	--
EUR / SGD	0.1	0.1	0.2	0.6	1	--
EUR / INR	< 0.1	0.1	0.1	0.2	1	--
EUR / TWD	< 0.1	< 0.1	0.1	0.2	2	--
EUR / IDR	< 0.1	< 0.1	< 0.1	0.1	3	--
JPY / Asia	0.3	0.3	0.9	1.7	1	--
JPY / KRW	< 0.1	0.1	0.3	0.7	2	--
JPY / SGD	0.1	0.1	0.2	0.4	1	--
JPY / THB	0.1	< 0.1	0.2	0.3	4	--
JPY / TWD	0.1	0.1	0.1	0.2	2	--
GBP / Asia[4]	< 0.1	0.1	0.2	0.6	0	--
GBP / SGD	< 0.1	< 0.1	0.1	0.4	1	--
CHF / Asia[4]	< 0.1	< 0.1	< 0.1	0.7	0	--
CHF / INR	< 0.1	< 0.1	< 0.1	0.5	2	--
AUD / Asia[4]	< 0.1	< 0.1	0.2	0.4	0	--
AUD / SGD	< 0.1	< 0.1	0.1	0.3	1	--
CAD / Asia[4]	< 0.1	< 0.1	< 0.1	0.2	0	--
CAD / SGD	< 0.1	< 0.1	< 0.1	0.2	0	--
Other[5] / Asia[4]	1.5	0.6	1.8	2.0	1	--
Other[5] / HKD	1.2	0.4	1.6	1.3	1	--
Other[5] / SGD	0.2	0.1	0.1	0.3	1	--

[1] Turnover unallocated by currency pair is redistributed in the same proportion as each currency pair's share of allocated turnover. [2] In percent. [3] Turnover unallocated by currency pair, as a percentage of each Asian currency's total turnover. [4] Sum of Asian currencies. [5] Transactions against currencies other than the USD, EUR, JPY, GBP, CHF, AUD and CAD.

Sources: BIS (Table E.7); authors' calculations. Table 4

Offshore turnover by financial centre

As a percentage of offshore turnover in April 2007[1, 2]

	All currencies	USD	EUR	JPY	CAD	AUD	Emerging market currencies[3]
Asian centres	23.0	28.8	14.0	22.2	15.8	29.5	28.0
Singapore	9.5	7.0	5.2	11.3	5.9	10.6	11.2
Hong Kong	4.6	5.8	1.9	3.6	1.7	7.6	5.5
Australia	3.9	5.3	2.5	3.6	3.2	. . .	5.9
Japan	3.2	6.9	3.6	. . .	4.6	8.6	4.8
Other centres	1.9	3.8	0.8	3.7	0.4	2.7	0.6
European centres	70.7	68.3	64.6	55.2	46.3	51.5	51.0
United Kingdom	48.7	41.4	47.0	37.8	33.9	38.3	28.9
Switzerland	7.9	7.1	8.7	5.9	3.7	4.2	4.7
Other centres	14.1	19.9	9.0	11.6	8.7	9.1	17.3
American centres	6.3	2.9	21.4	22.6	37.8	19.0	21.1
United States	5.3	. . .	20.7	21.9	37.7	17.8	20.4
Other centres	1.0	2.9	0.7	0.7	0.1	1.2	0.7
Memo: Total[2, 4]	3 988.1	3 462.8	1 467.8	679.8	165.3	268.6	706.6
Onshore[2, 4]	1 807.9	548.3	264.5	169.6	40.4	84.6	310.2
Offshore[2, 4]	2 180.2	2 914.5	1 203.3	510.2	124.9	184.0	396.4

[1] Transactions with dealers residing outside the currency's country of issue; specified currency against all other currencies; excludes turnover of currency swaps and options. [2] Not adjusted for cross-border interdealer double counting, ie "net-gross" turnover. [3] Currencies of 24 reporting countries mainly from non-Japan Asia, eastern Europe, Latin America, the Middle East and Africa; includes a few developed market currencies (DKK, NOK and NZD). [4] In billions of US dollars.

Sources: BIS (Tables E.4 and E.7); authors' calculations. Table 5

Foreign exchange turnover by instrument

Average daily turnover in April 2007, in billions of USD[1]

	Total	Spot	OTC derivatives				
			Outright forwards		FX swaps	Currency swaps	Options
			Total	Offshore			
All	3 453.2	1 004.9	361.7		1 714.4	31.5	211.7
AUD	220.0	52.8	20.5	14.2	132.0	1.8	12.9
CAD	142.6	38.5	15.3	12.3	76.0	2.4	10.4
EUR	1 231.2	420.0	137.4	100.4	582.0	11.2	80.5
GBP	494.2	149.9	46.3	20.7	264.6	5.1	28.4
JPY	573.4	206.0	61.5	43.7	242.3	3.5	60.2
NZD	63.0	17.3	6.6	6.2	34.8	0.5	3.8
USD	2 845.4	790.2	289.4	197.0	1.580.6	27.3	157.9
Asia	249.0	69.5	38.8	26.2	126.7	2.9	11.1
CNY	15.0	9.0	4.6	. . .	1.1	0.1	0.2
HKD	101.7	15.7	6.0	3.9	75.7	0.4	3.9
IDR	3.7	1.4	1.3	. . .	0.6	0.2	0.2
INR	23.6	9.0	5.8	3.4	6.3	0.4	2.1
KRW	38.6	15.2	10.0	. . .	8.8	1.5	3.1
MYR	4.4	1.6	1.5	1.1	1.2	< 0.1	0.1
PHP	3.5	1.3	1.1	0.9	1.1	< 0.1	< 0.1
SGD	39.9	9.5	3.0	2.2	26.2	0.2	1.0
THB	6.5	1.2	0.8	. . .	4.3	0.1	0.1
TWD	12.1	5.5	4.7	. . .	1.4	0.1	0.3

[1] Specified currency against all other currencies; adjusted for local and cross-border inter-dealer double counting; data might differ from published BIS data because of differences in aggregation procedures.

Sources: BIS (Tables E.1 and E.20); authors' calculations. Table 6

Turnover of Asian currencies in Tokyo

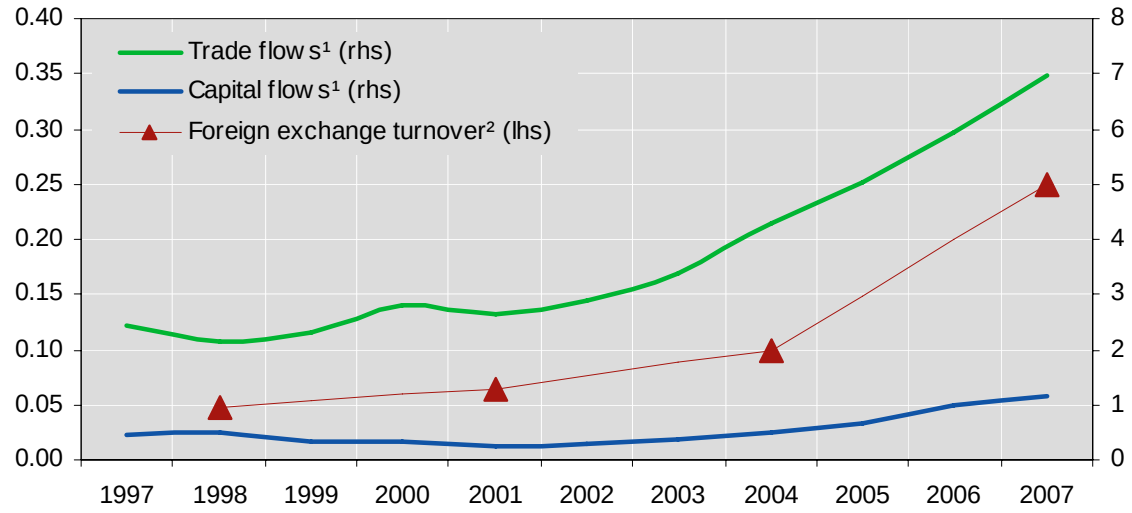
Total monthly turnover in April 2007, in millions of USD

	Total	Spot	FX swaps	Outright forwards	
				Deliverable	Non-deliverable
CNY	6,959	179	10	9	6,761
HKD	96,044	25,742	63,615	6,687	0
IDR	1,718	277	178	78	1,185
INR	10,662	1,682	65	230	8,685
KRW	30,768	3,693	934	767	25,374
MYR	4,463	1,147	0	83	3,233
PHP	2,028	150	7	21	1,850
SGD	22,824	10,932	9,202	2,690	0
THB	3,628	1,289	1,675	664	0
TWD	9,503	1,931	14	313	7,245

Sources: Tokyo Foreign Exchange Market Committee (2007). Table 7

Trade and capital flows

Asia excluding Japan, in trillions of US dollars

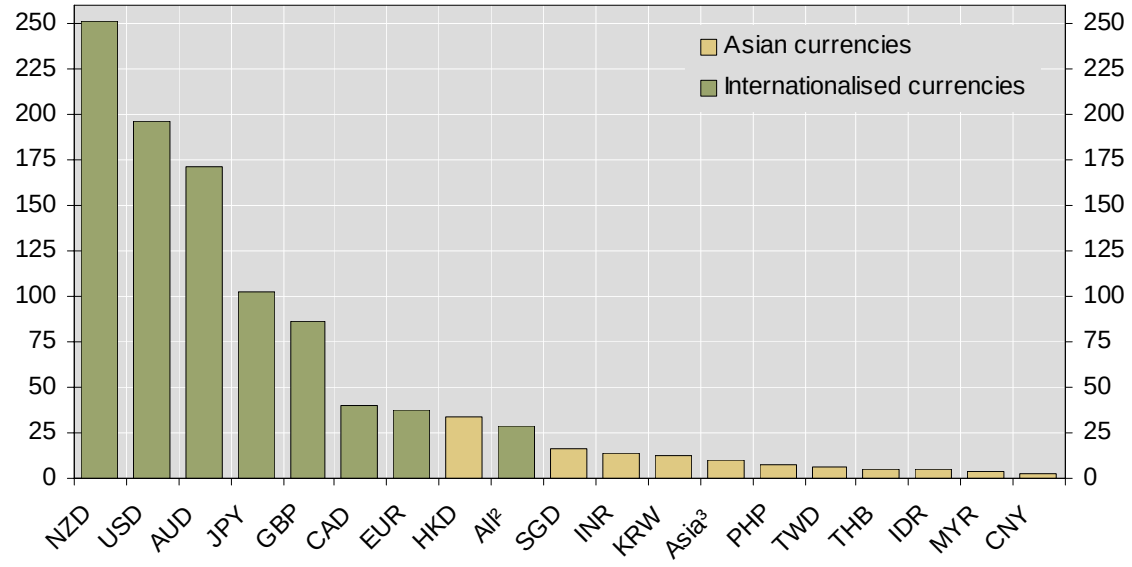


[1] Gross flows; for 2007, IMF estimates from the October 2007 *World Economic Outlook*. [2] Spot plus OTC derivatives transactions.

Sources: BIS (Tables E.1 and E.20); IMF; authors' calculations. Graph 1

Ratio of foreign exchange turnover to trade flows

Average daily turnover in April 2007 divided by average daily gross trade flows in 2006[1]

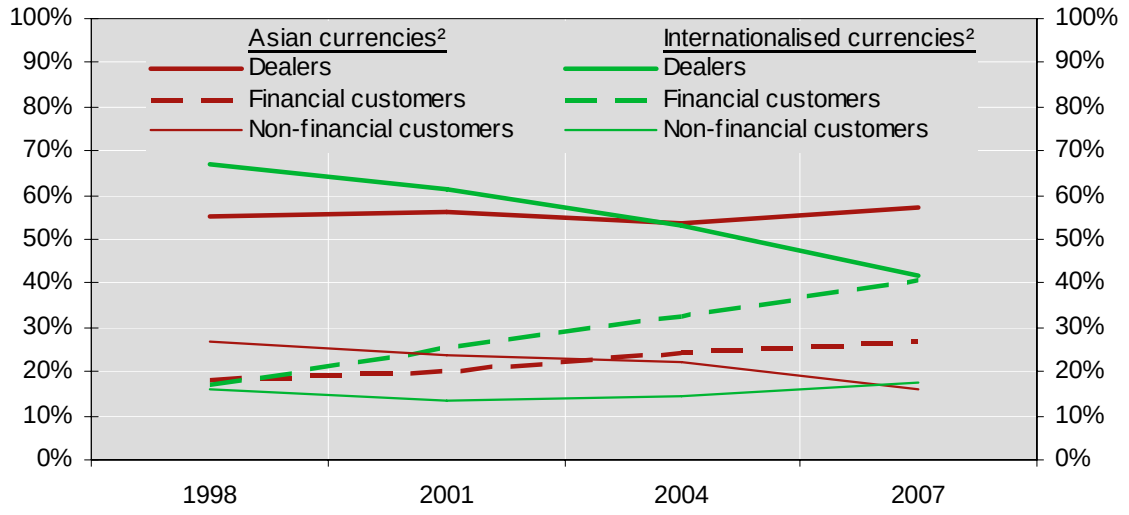


[1] Trade flows are converted from annual data by dividing by 252. [2] Trade-weighted average of all countries. [3] Trade-weighted average of countries in non-Japan Asia.

Sources: BIS (Tables E.1 and E.20); IMF; authors' calculations. Graph 2

The rising importance of financial customers

Turnover by counterparty as a percentage of average daily turnover[1]

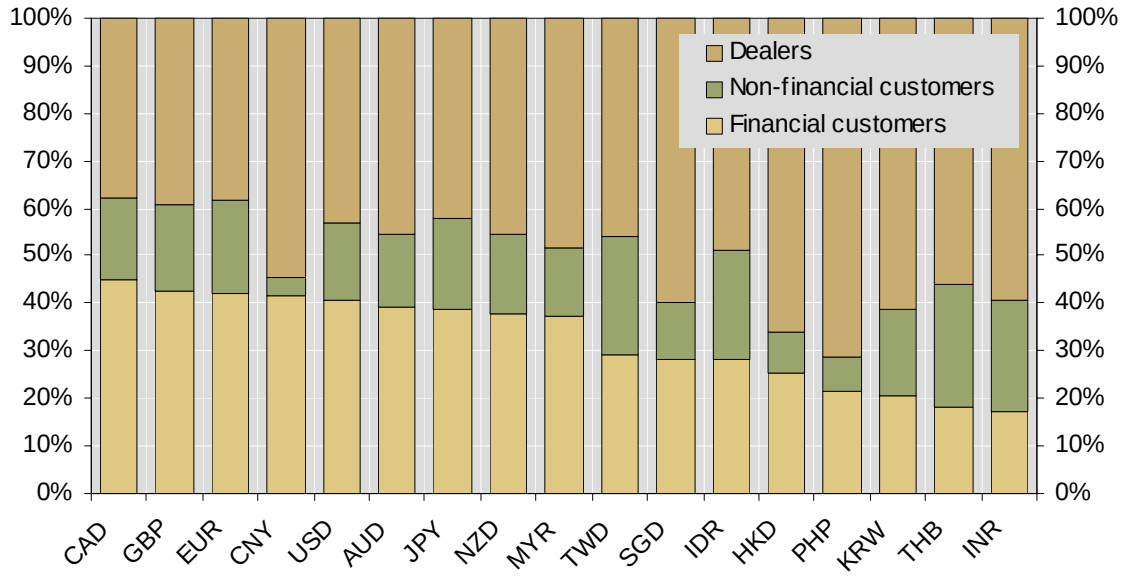


[1] Spot plus OTC derivatives transactions, adjusted for local and cross-border inter-dealer double counting. [2] Equally weighted average of currencies in each group.

Sources: BIS (Tables E.1 and E.20); authors' calculations. Graph 3

Turnover by counterparty

As a percentage of average daily turnover in April 2007[1]

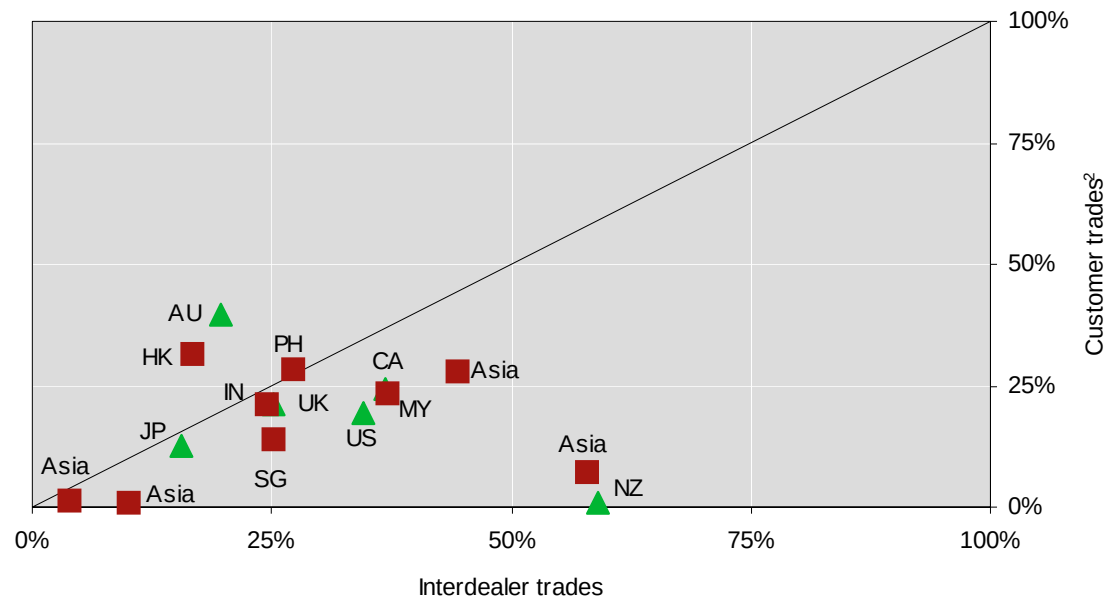


[1] Specified currency against all other currencies; spot plus OTC derivatives transactions, adjusted for local and cross-border inter-dealer double counting.

Sources: BIS (Tables E.1 and E.20); authors' calculations. Graph 4

Penetration of electronic trading platforms

Share of trading conducted via electronic brokers or multi-dealer platforms[1]

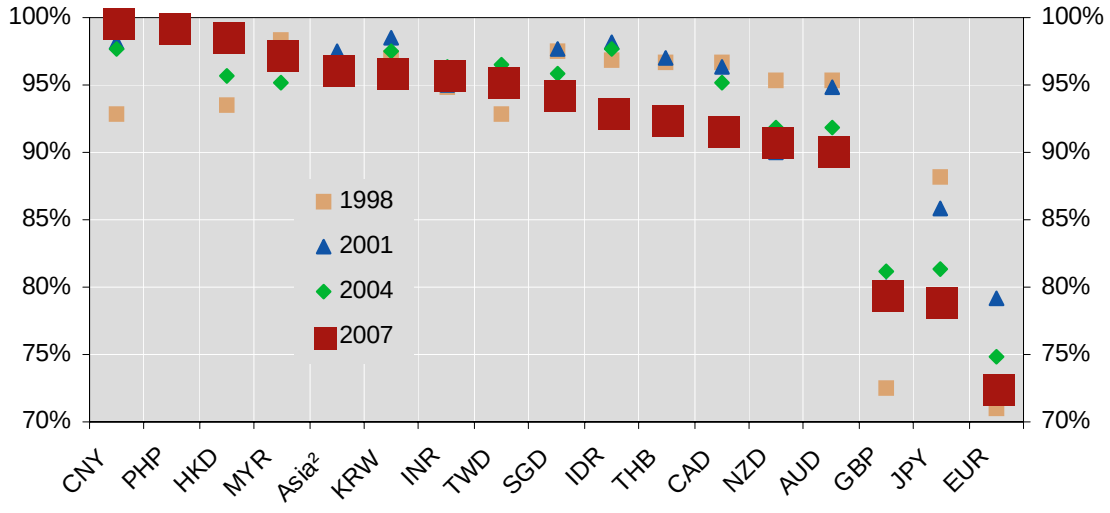


[1] Turnover of all currencies in a given country, in April 2007; not adjusted for either local or cross-border interdealer double counting. [2] Transactions with financial and non-financial customers.

Sources: BIS; authors' calculations. Graph 5

Turnover of USD crosses

Transactions against USD, as a percentage of turnover allocated by currency pair[1]

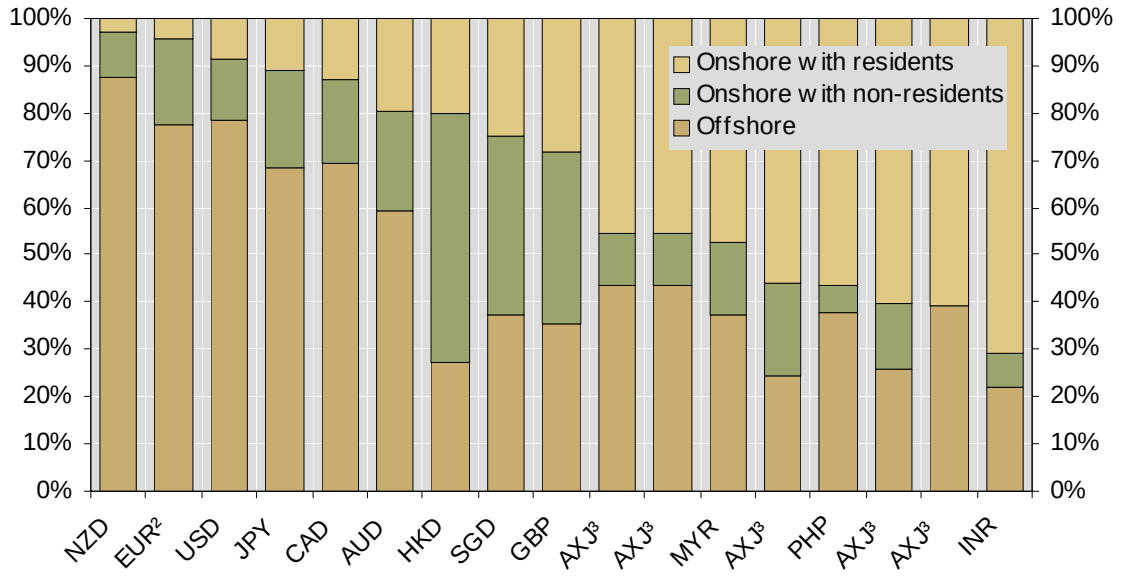


[1] Spot plus OTC derivatives transactions, adjusted for local and cross-border interdealer double counting. [2] Equally weighted average of Asian currencies.

Sources: BIS (Tables E.5 and E.7); authors' calculations. Graph 6

Turnover by location

As a percentage of turnover allocated by counterparty[1]

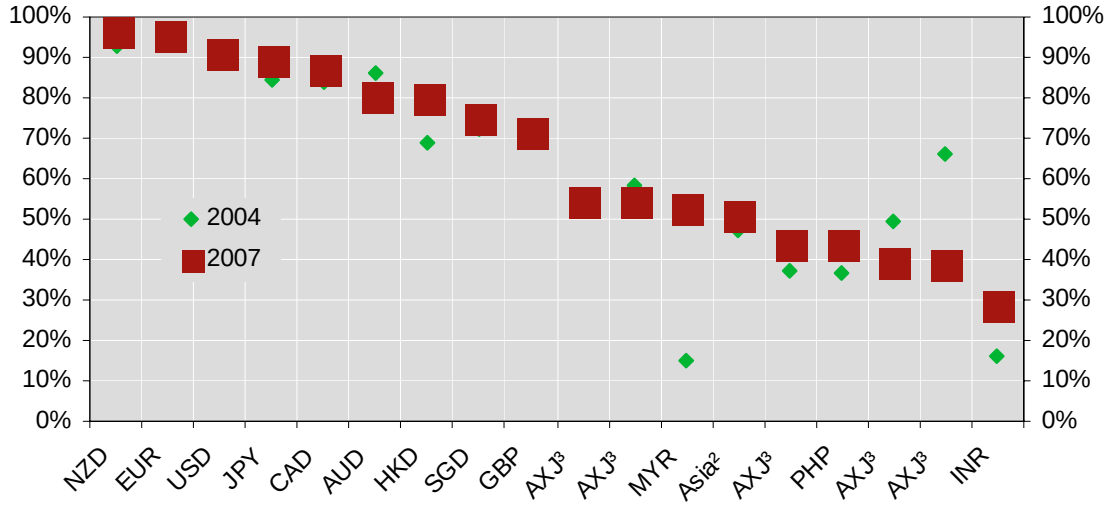


[1] Spot plus OTC derivatives transactions in April 2007; specified currency against all other currencies; adjusted for local and cross-border inter-dealer double counting. [2] Cross-border transactions between residents of different euro area countries are categorised as trades with non-residents. [3] Currency from non-Japan Asia.

Sources: BIS (Tables E.1 and E.7); authors' calculations. Graph 7

Progress of currency internationalisation

Transactions with non-residents, as a percentage of turnover allocated by counterparty[1]

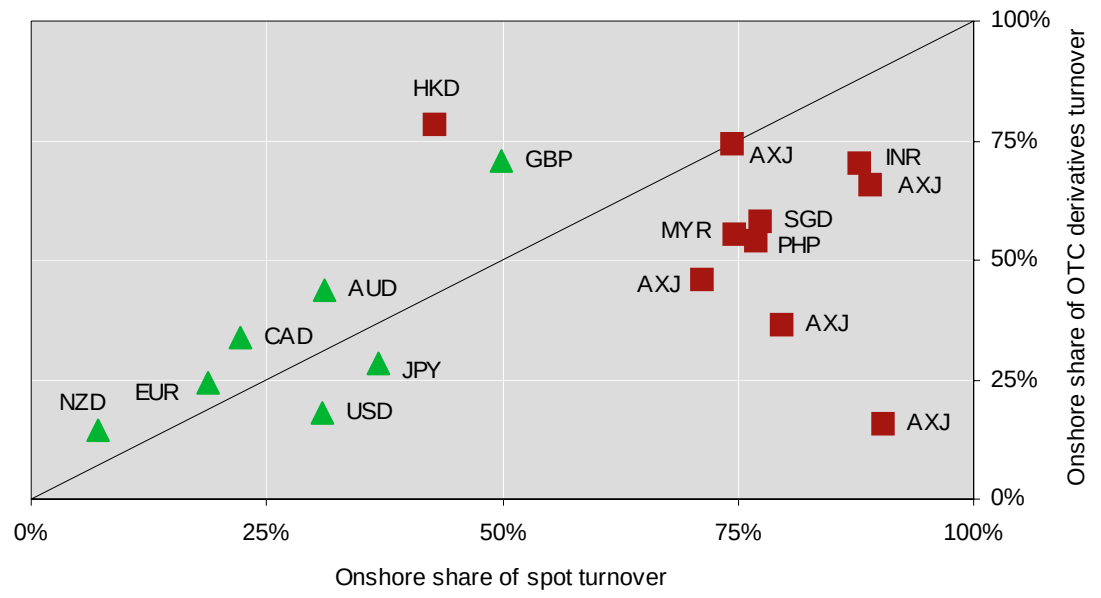


[1] Transactions involving one or more counterparties residing outside of the currency's country of issue; specified currency against all other currencies; spot plus OTC derivatives transactions, adjusted for local and cross-border inter-dealer double counting. [2] Equally weighted average of Asian currencies. [3] Currency from non-Japan Asia.

Sources: BIS; authors' calculations. Graph 8

Onshore trading: spot versus derivatives markets

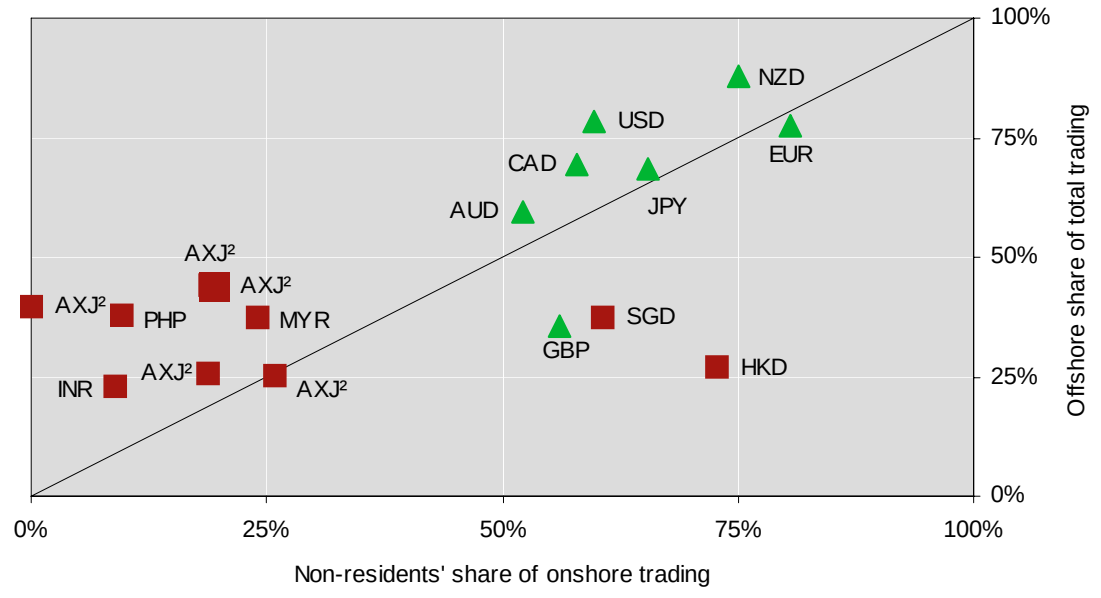
As a percentage of average daily turnover in April 2007[1]



[1] Onshore trading refers to transactions with dealers residing inside the currency's country of issue, adjusted for local and cross-border inter-dealer double counting; specified currency against all other currencies; if the currency lies below the 45° line, then the onshore share of spot trading exceeds the onshore share of OTC derivatives trading.

Sources: BIS; authors' calculations. Graph 9

Transactions with non-residents[1]

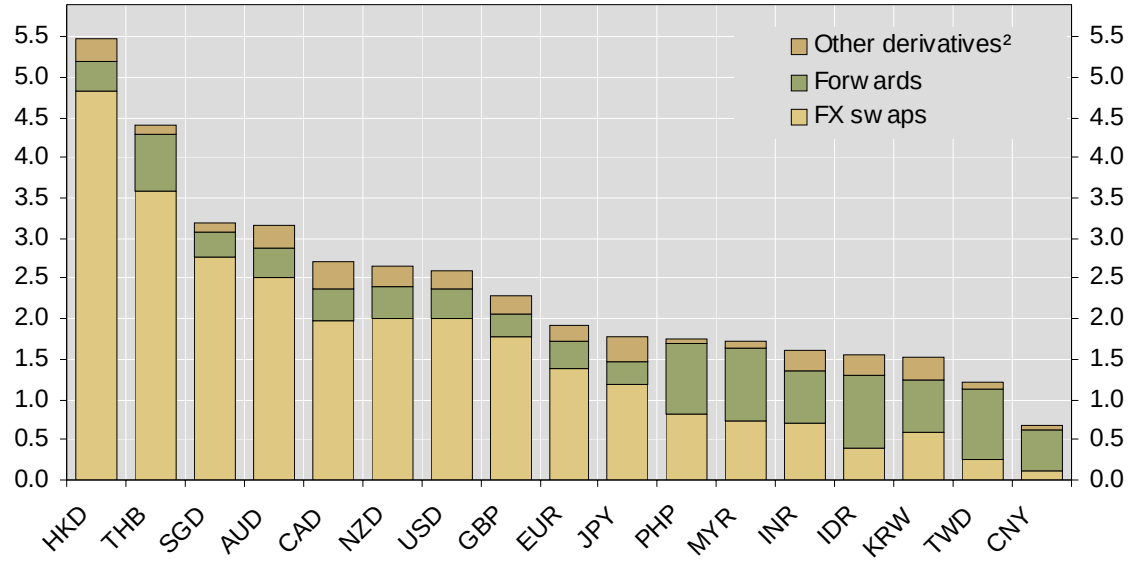


[1] Spot plus OTC derivatives transactions in April 2007; specified currency against all other currencies; adjusted for local and cross-border inter-dealer double counting. [2] Currency from non-Japan Asia.

Sources: BIS; authors' calculations. Graph 10

Turnover of OTC foreign exchange derivatives[1]

As a ratio of spot trading in April 2007

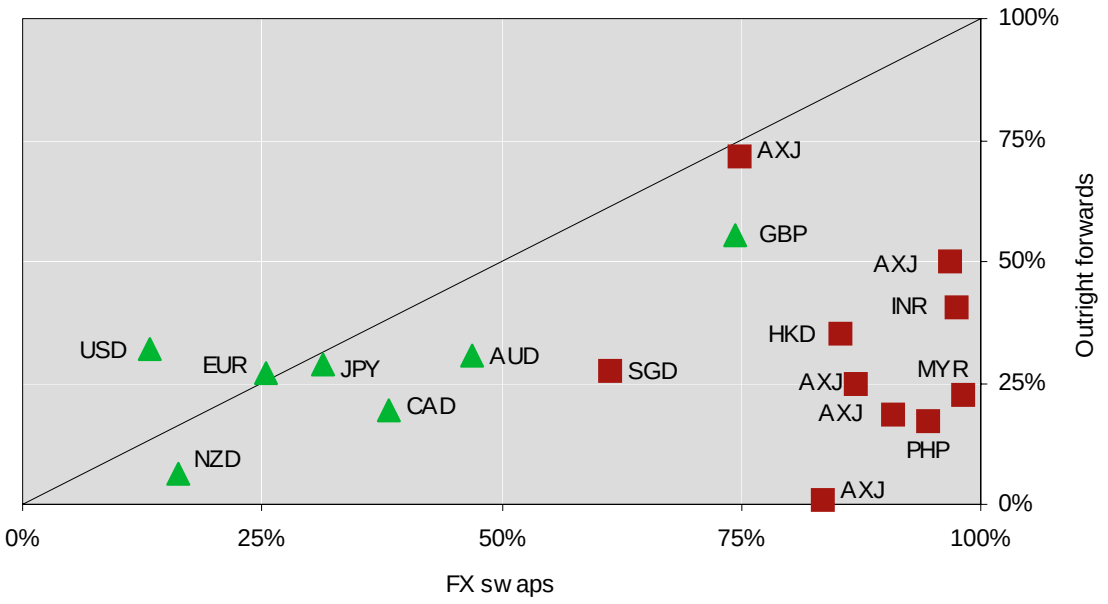


[1] Specified currency against all other currencies, adjusted for local and cross-border inter-dealer double counting. [2] Cross-currency swaps and options.

Sources: BIS (Tables E.1 and E.20); authors' calculations. Graph 11

Onshore trading: FX swaps versus forwards

As a percentage of average daily turnover in April 2007[1]



[1] Onshore turnover refers to transactions with dealers residing inside the currency's country of issue, adjusted for local and cross-border inter-dealer double counting; specified currency against all other currencies.

Sources: BIS; authors' calculations. Graph 12

Overview of restrictions on foreign exchange transactions

Selected Asian currencies, at end-April 2007

	Deliverable transactions between:				Non-deliverable transactions between onshore dealers and offshore counterparties
	Onshore dealers and onshore counterparties	Onshore dealers and offshore counterparties	Offshore dealers and offshore counterparties		
			Spot	Forwards / swaps	
Deliverable currencies					
HKD	None	None	None	None	--
SGD	None	None[1]	None	None	--
THB	Underlying transaction required	Underlying transaction required[2]	None	None	--
Non-deliverable currencies					
CNY	Underlying transaction required	Prohibited	Prohibited	Prohibited	Prohibited
IDR	Free	Underlying transaction required	Prohibited[3]	Prohibited	Prohibited
INR	Underlying transaction required	Spot purchases are permitted for current account transactions	Purchases are permitted	Prohibited	Prohibited
KRW	Free (supporting documents required)	Spot sales and purchases are permitted for current account transactions, through free won accounts[4]	Prohibited	Prohibited	Permitted
MYR	Underlying transaction required	Underlying transaction required	Prohibited[5]	Prohibited	Prohibited
PHP	To sell PHP, underlying transaction required	Spot purchases are permitted for current account transactions	Purchases are permitted	Prohibited	Permitted with prior approval
TWD	Underlying transaction required	Prohibited	Prohibited	Prohibited	Permitted with offshore branches of local banks

[1] Aggregate credit facilities exceeding SGD 5 million to non-resident financial institutions for use outside Singapore are to be swapped out or converted to foreign currency upon draw-down. [2] On 18 December 2006, the Bank of Thailand announced the implementation of 30% unremunerated reserve requirements on short-term capital inflows. At the same time, when Thai residents deposited baht into non-resident baht accounts for payment for goods and services or repatriation of foreign investment or loans, such deposits were required to be withdrawn and converted into foreign currency within the day. These controls were relaxes in January 2008 and lifted in March 2008. [3] Non- bank non-residents may buy IDR but must remit IDR to onshore immediately and cannot hold IDR outside the country. [4] Non-residents may access the onshore market through special domestic currency account for security investment provided that FX transactions are linked to an investment in domestic securities. [5] Non-bank non-residents may buy MYR but must remit MYR to onshore immediately and cannot hold MYR outside the country (from April 2007).

Sources: ANZ; Bank of Tokyo Mitsubishi UFJ; Citibank; Deutsche Bank; HSBC.

Annex A

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