MFE 230G Currency Markets

Amir Kermani

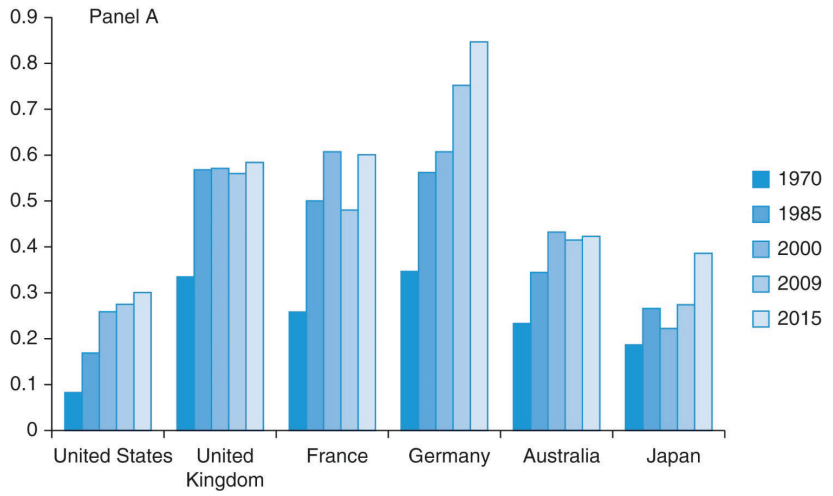
Introduction

- Globalization
  - Increasing connectivity and integration of countries and corporations and the people within them in terms of their economic, political, and social activities
- Multinational corporations
  - Produce and sell goods or services in more than one nation
  - BRIC countries (Brazil, Russia, India and China) offer a lot of opportunities for expansion
- International scope creates opportunities but also challenges
  - Recent crisis

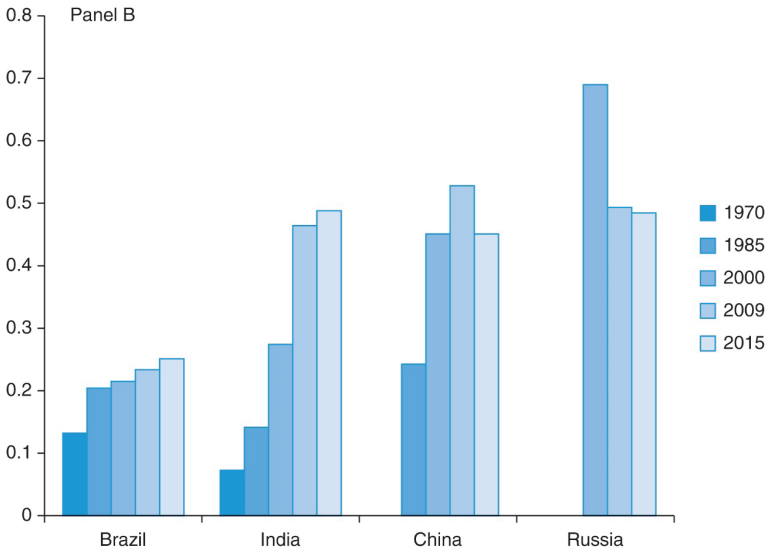
Globalization and the Growth of International Trade and Capital Flows

- Incredible growth in MNCs after WWII
  - 37,000 MNCs in 1990
  - 82,053 in 2010
  - More than 50% of international trade occurs within MNCs
- Globalization of financial markets
  - Trends in financial openness
    - Countries began to allow foreigners to invest in their markets (1980s)
    - Creation of new asset class – emerging markets
  - New financial landscape – derivatives
    - An investment whose payoff over time is derived from the performance of underlying assets (futures, forwards…)
    - Securitization – repackaging of "pools" of loans or other receivables to create a new financial instrument

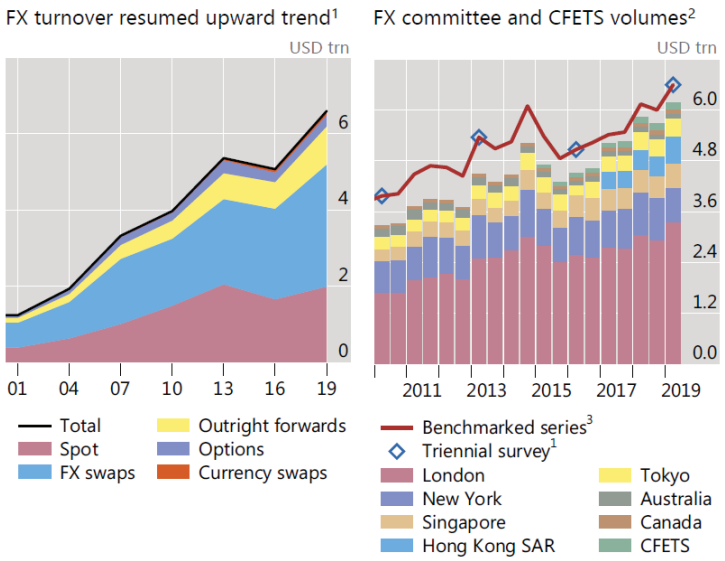
International Trade as a Percentage of GDP



International Trade as a Percentage of GDP



Market for foreign exchange is the largest financial market in the world by virtually any standard



What Explains FX Trading Growth?

Drivers of FX trading growth — Table 1

	(1)	(2)	(3)	(4)	(5)
Trade flows	0.16*** (0.03)	0.15*** (0.03)	0.09** (0.04)	0.08** (0.03)	0.07** (0.03)
Corporate clients		–0.08** (0.03)			
Financial flows			0.15*** (0.04)	0.16*** (0.03)	0.15*** (0.03)
Financial clients				0.13*** (0.04)	0.08** (0.04)
Offshore share					0.11*** (0.03)
Number of observations	194	188	154	151	151
R-squared	0.12	0.14	0.21	0.27	0.32

The following variables are specified as log differences: FX turnover (USD millions); trade flows = exports plus imports of goods and services (USD millions); corporate clients = share of non-financial counterparties in total turnover; financial flows = net acquisition of financial assets plus net incurrence of liabilities (USD millions). The following variables are specified as changes in integer percentage shares between surveys: financial clients = share of (non-dealer) financial counterparties; offshore share = share of offshore turnover (intra-euro area transactions are classified as offshore in the calculation of the EUR offshore share).

Panel data for 26 individual currencies in five survey periods (2007, 2010, 2013, 2016 and 2019). Coefficients and standard errors scaled by the standard deviation of each variable in order to infer economic magnitudes; standard errors in brackets. ***/**/* indicates p-values less than 0.01/0.05/0.1, respectively. Constant not shown.

Sources: IMF, *Balance of Payments Statistics* and *World Economic Outlook*; BIS Triennial Central Bank Survey; authors' calculations.

Function and Structure of FX Market

Function of FX market is to assist clients in the conduct of international commerce

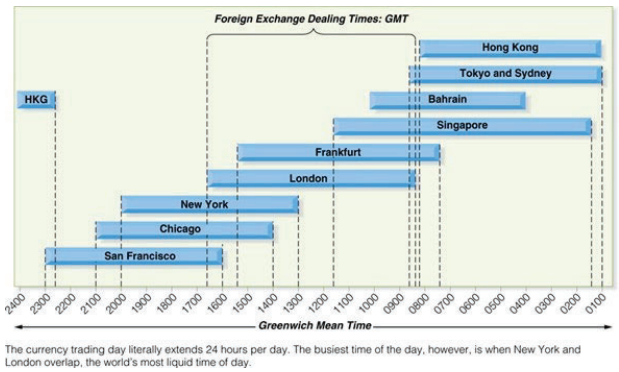
- Service that commercial banks provide to their clients

Spot and forward FX markets are **OTC markets**, meaning trading does not take place in a central marketplace where buyers and sellers congregate

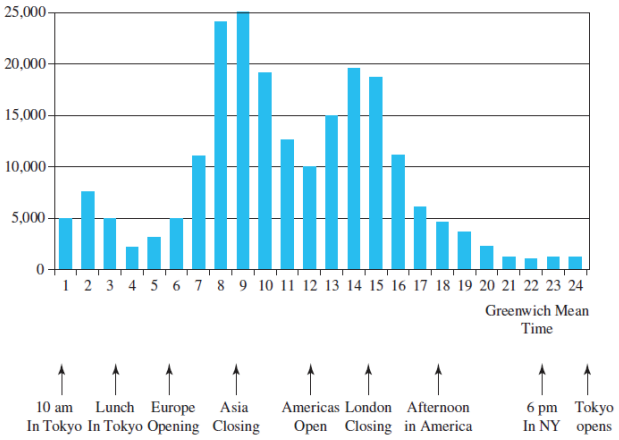
Major market segments

1. Australasia: Sydney, Tokyo, Hong Kong, Singapore, and Bahrain
2. Europe: Zurich, Frankfurt, Paris, Brussels, Amsterdam, and London
3. North America: New York, Montreal, Toronto, Chicago, San Francisco, and Los Angeles

Average Electronic Foreign Exchange Conversations per Hour (Monday to Friday, 2001)

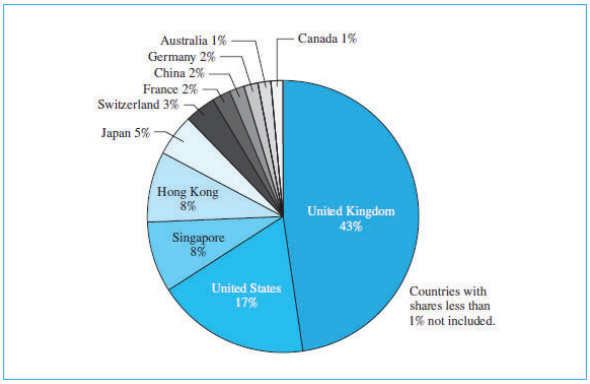


The currency trading day literally extends 24 hours per day. The busiest time of the day, however, is when New York and London overlap, the world's most liquid time of day.



Source: Federal Reserve Bank of New York, "The Foreign Exchange Market in the United States," 2001, www.newyorkfed.org.

Shares of Reported Global Foreign Exchange Turnover by Country



Note: Turnover is net of local interdealer double-counting. Currency swaps and FX options are not included.

Source: Tabulated from data in *Triennial Central Bank Survey, Preliminary Results*, Bank for International Settlements, September 2019.

FX Market Participants

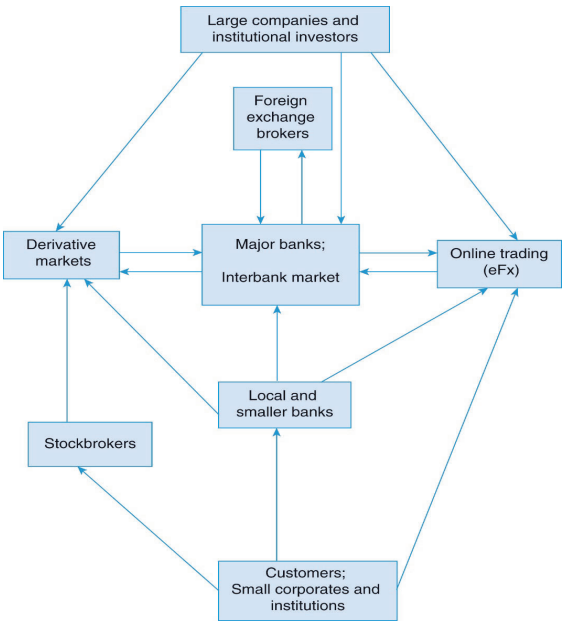
FX market is a two-tier market

1. **Interbank (wholesale) market**
   - About 100 to 200 banks worldwide stand ready to "make a market" in foreign exchange
   - Nonbank dealers account for about 40% of the market
   - There are FX brokers who match buy and sell orders but do not carry inventory and FX specialists
2. **Client (retail) market**

Market participants include international banks, their customers, nonbank dealers, FX brokers, and central banks

The Structure of the Foreign Exchange Market

- ForEx (or FX) operates 24 hrs/day
  - Interbank market (39%)
  - Corporations (9%)
  - Other financial institutions (53%)
  - Most trades are $1M or more!



Correspondent Banking Relationships

Interbank market

- Made up of a network of **correspondent banking relationships**, with large commercial banks maintaining demand deposit accounts (that is, correspondent banking accounts) with one another
- Correspondent bank account network facilitates the efficient functioning of the FX market

Correspondent Banking Communications

International commercial banks communicate with one another using:

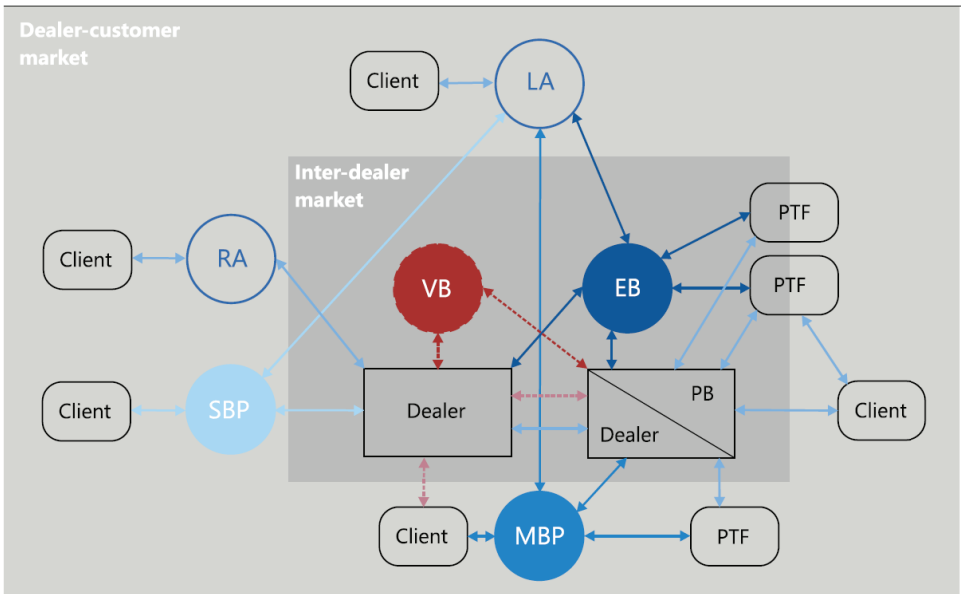
- SWIFT: **S**ociety for **W**orldwide **I**nterbank **F**inancial **T**elecommunications
- CHIPS: **C**learing **H**ouse **I**nterbank **P**ayments **S**ystem
- ECHO: **E**xchange **C**learing **H**ouse **L**imited
  - First global clearinghouse for settling interbank FX transactions

Electronic foreign exchange trading (eFX)

- > 30% of all trading volume and > 50% in spot markets
- Straight Through Processing (STP)
  - Forex trade takes place from placement of order to settlement in automated fashion
- Three categories
  - Single bank sponsored platforms ("portals")
    - Best known and most active platform is FXConnect (State Street)
  - Multi-bank portals
    - Another leader is FXall (consortium of banks)
  - Independent companies
    - HotSpot and Currenex
- Originally designed for corporate clients or institutional investors but got a boost from hedge funds and retail aggregators

Stylised structure of the FX market

Graph 1

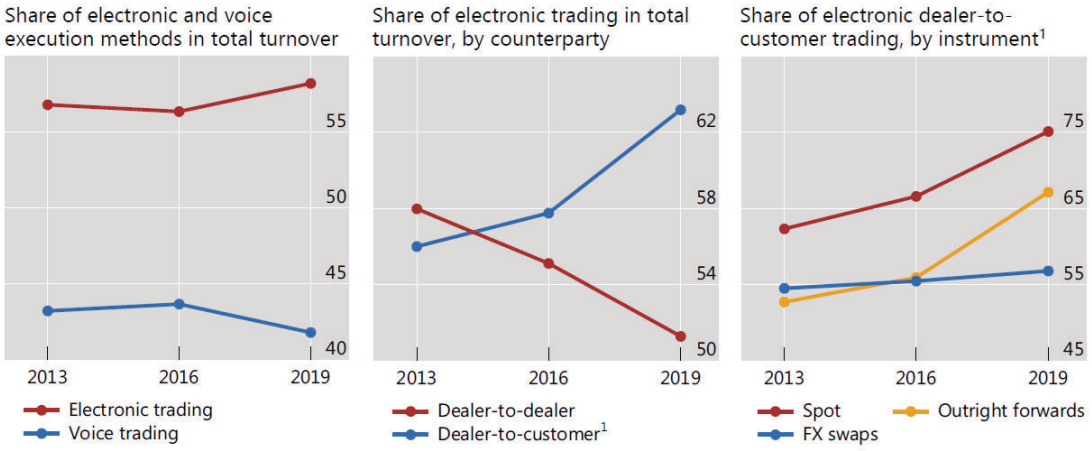


EB = electronic broker; LA = liquidity aggregator; MBP = multi-bank platform; PB = prime broker; PTF = principal trading firm; RA = retail aggregator; SBP = single-bank platform; VB = voice broker. Dashed lines indicate voice execution; solid lines indicate electronic execution.

Source: King et al (2012), augmented by adding LA to depict liquidity aggregators and PTFs in their roles as both clients and intermediaries.

Uneven pace of foreign exchange market electronification

In per cent — Graph 3



[1] Based on dealer trading with other financial institutions.

Sources: BIS Triennial Central Bank Survey; authors' calculations.

The Organization of the Foreign Exchange Market

- The competitive marketplace
  - No product differentiation – money is money
  - Has been a lot of players (past)
    - Top 4 account for less than 30%
    - Top 20 less than 75%
  - Recently, there has been consolidation (2014)
    - Top 4 account for over 40%
    - Top 20 over 90%
  - Still exceedingly competitive with no signs of any dominant leader in this market

The Top 20 Dealers in the Foreign Exchange Market

Exhibit 2.3 The top 20 dealers in the foreign exchange market

Rank 2015	Company	Market share	Rank 2014	Market share 2000[1]
1	Citigroup	16.11%	1	8.07%
2	Deutsche Bank	14.54%	2	12.53%
3	Barclays	8.11%	3	2.07%
4	JPMorgan Chase[2]	7.65%	6	12.10%
5	UBS[3]	7.30%	4	5.02%
6	Bank of America Merrill Lynch	6.22%	7	1.86%
7	HSBC	5.40%	5	4.55%
8	BNP Paribas	3.65%	9	–
9	Goldman Sachs	3.40%	10	4.38%
10	Royal Bank of Scotland[4]	3.38%	8	2.71%
11	Société Générale	2.43%	13	0.60%
12	Standard Chartered	2.40%	14	0.62%
13	Morgan Stanley	1.97%	11	2.87%
14	Credit Suisse	1.66%	12	2.89%
15	State Street	1.55%	16	1.95%
16	Nomura	1.17%	15	–
17	Crédit Agricole	0.99%	22	–
18	Commerzbank	0.94%	18	–
19	RBC Capital Markets	0.74%	19	–
20	Westpac Banking Corporation	0.73%	17	–
	Total	91.26%		

Spot Market

Spot market involves almost immediate purchase or sale of foreign exchange

One can buy (take a long position) or sell (take a short position) foreign exchange

Cash settlement is usually made in two business days after the transaction for trades between the U.S. dollar and a non-North American currency

- Dollar transactions are settled through the computerized Clearing House Interbank Payment System.

Spot Rate Quotations[1]

Spot rate currency quotations can be stated in direct or indirect terms

- **Direct quotations** refer to the price of one unit of a foreign currency in terms of the domestic currency
- **Indirect quotation** is the price of one domestic currency in terms of a foreign currency

Exchange Rates[1]

Currencies **April 3, 2019**

U.S.-dollar foreign-exchange rates in late New York trading

Country/Currency	—Wed— In US$	Per US$
Americas		
Argentina peso	.0233	42.854
Brazil real	.2583	3.8715
Canada dollar	.7493	1.3345
Chile peso	.001500	666.73
Colombia peso	.000320	3123.6
Ecuador US dollar	1	1
Mexico peso	.0520	19.220
Peru new sol	.3034	3.296
Uruguay peso	.02965	33.4300
Asia Pacific		
Australian dollar	.7113	1.4060
1-mos forward	.7117	1.4051
3-mos forward	.7125	1.4035
6-mos forward	.7139	1.4008
China yuan	.1490	6.7114
Hong Kong dollar	.1274	7.8494

Country/Currency	—Wed— In US$	Per US$
Asia Pacific		
India rupee	.01461	68.425
Indonesia rupiah	.0000703	14223
Japan yen	.00897	111.49
1-mos forward	.00899	111.22
3-mos forward	.00903	110.70
6-mos forward	.00910	109.90
Malaysia ringgit	.2452	4.0790
New Zealand dollar	.6778	1.4753
Pakistan rupee	.00709	140.47
Philippines peso	.0192	52.124
Singapore dollar	.7387	1.3537
South Korea won	.0008814	1134.5
Taiwan dollar	.03246	30.812
Thailand baht	.03150	31.748
Vietnam dong	.00004	23146.3

Average Daily Foreign Exchange Turnover by Instrument and Counterparty

Instrument/ Counterparty	Turnover in USD (billion)	Turnover in USD (billion)	Percent	Percent
Spot		*1,987*		*32*
with reporting dealers	593		10	
with other financial institutions	1,236		20	
with nonfinancial customers	159		3	
Outright Forwards		*999*		*16*
with reporting dealers	268		4	
with other financial institutions	615		10	
with nonfinancial customers	116		2	
Foreign Exchange Swaps		*3,202*		*52*
with reporting dealers	1,498		24	
with other financial institutions	1,537		25	
with nonfinancial customers	166		3	
Total		6,188		100

Note: Turnover is net of local and cross-border interdealer double-counting.

Source: Tabulated from data in Table 4 in *Triennial Central Bank Survey. Preliminary Results.* Bank for International Settlements, September 2019.

Spot Rate Quotations[2]

Most currencies are quoted in **European terms**, meaning the U.S. dollar is priced in terms of the foreign currency (an indirect quote from the U.S. perspective)

- **American terms** are a direct quote from the U.S. perspective

Cross-exchange rate is an exchange rate between a currency pair where neither currency is the U.S. dollar

The Bid-Ask Spread

Interbank FX traders buy currency for inventory at the **bid price** and sell from inventory at the higher **offer** or **ask price**

Average of the bid and ask rates are called *mid-rates*

Bid-ask spread allows dealers to earn a profit

Spot FX Trading

In the interbank market, the standard size trade is about $10 million

Spot quotations are good for only a few seconds before being withdrawn

Bid-ask quotes are normally four decimal places (for example, $1.3153)

- $1.31 is known as the bid quote *big figure* and assumed to be known by all traders
- Last two digits (.53) is the *small figure*

Cross-Rate Trading Desk

Currency against currency trade is when a customer wants to trade out a nondollar currency for another nondollar currency

- For example, a customer wants to trade out of British pounds into Swiss francs
- Typically handled by the bank selling British pounds for U.S. dollars and then selling U.S. dollars for Swiss francs
- Handled at the cross-rate desk of the bank

Triangular Arbitrage

Triangular arbitrage is the process of trading out of the U.S. dollar into a second currency, then trading it for a third currency, which in turn is traded for U.S. dollars

- Purpose is to earn an *arbitrage* profit via trading from the second to the third currency when the direct cross-exchange rate between the two is not in alignment with the implied cross-exchange rate
- Arbitrage is a zero-risk, zero-investment strategy from which a profit is guaranteed

Spot Foreign Exchange Market Microstructure

Market microstructure refers to the basic mechanics of how a marketplace operates

- Studies have shown:
  - Bid-ask spreads in the spot FX market increased with FX exchange rate volatility and decreased with dealer competition
  - $1b of net dollar purchases increase the deutsche mark price of a dollar by 0.5 percent
  - Bid-ask spreads have a prolonged U shape and are narrowest when London and NY are open, while trading volume and exchange rate volatility are both M-shaped with peaks at London open and the NY open

The Forward Market

Forward market involves contracting today for the future purchase or sale of FX

- No money changes hands upon entering the contract today
- May be used to hedge FX exposure or to speculate in FX market
- Forward price is usually higher (at a premium) or lower (at a discount) than spot price
- Bank quotes for maturities of 1, 3, 6, 9, and 12 months are readily available

Forward Rate Quotations[1]

Forward rate quotations use the following notations:

- $F_N(j/k)$ is the notation used to refer to the price of one unit of currency k in terms of currency j for delivery in N months
- F notation is used to denote a forward exchange rate
- Like spot quotes, forward quotes are either direct or indirect with one being the reciprocal of the other

Forward Cross-Exchange Rates

$$F_N(j/k) = \frac{F_N(\$/k)}{F_N(\$/j)} \qquad F_N(k/j) = \frac{F_N(\$/j)}{F_N(\$/k)}$$

$$F_N(j/k) = \frac{F_N(j/\$)}{F_N(k/\$)} \qquad F_N(k/j) = \frac{F_N(k/\$)}{F_N(j/\$)}$$

EUR/USD Forward Rates

As of: 15:49 Sep 09, 2020, PDT

Expiration	Ask	Bid	Mid	Points
Overnight	1.1806	1.1806	1.1806	0.2400
Tomorrow Next	1.1807	1.1807	1.1807	0.7100
Spot Next	1.1806	1.1806	1.1806	0.2400
One Week	1.1808	1.1808	1.1808	1.7000
Two Weeks	1.1810	1.1809	1.1810	3.4800
Three Weeks	1.1812	1.1812	1.1812	5.9700
One Month	1.1815	1.1813	1.1814	8.2490
Two Months	1.1823	1.1823	1.1823	16.700
Three Months	1.1831	1.1829	1.1830	24.021
Four Months	1.1844	1.1843	1.1843	37.200
Five Months	1.1852	1.1851	1.1852	45.650
Six Months	1.1859	1.1858	1.1859	52.500

Non-Deliverable Forward Contracts

Due to government-instituted capital controls, currencies of some emerging market countries are not freely traded

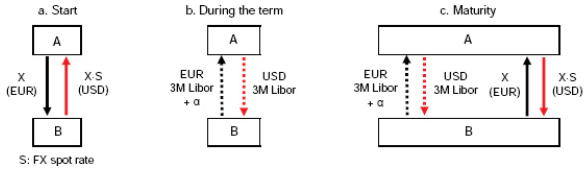
- Not possible to obtain these currencies offshore in the spot market to settle a forward position
- For many of these currencies, trading in *non-deliverable forward (NDF)* contracts exists
- An NDF contract, unlike a deliverable forward (DF), is settled in cash at the difference between the spot exchange on the maturity date of the contract and the NDF rate times the notional amount of the contract

- Argentina (ARS)
- Brazil (BRL)
- Chile (CLP)
- China (CNY)
- Colombia (COP)
- Egypt (EGP)
- Indonesia (IDR)
- India (INR)
- Kazakhstan (KZT)
- Kenya (KES)
- Korea (South) (KRW)
- Malaysia (MYR)
- Nigeria (NGN)
- Peru (PEN)
- Philippines (PHP)
- Taiwan (TWD)
- Vietnam (VND)

FX Swaps

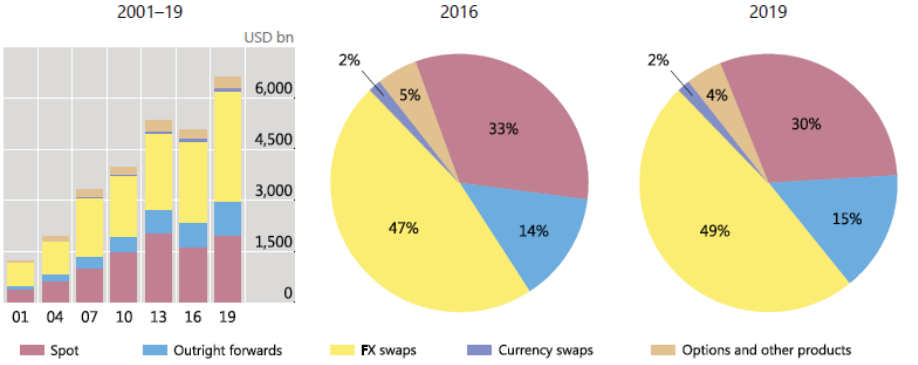
- An FX swap agreement is a contract in which one party borrows one currency from, and simultaneously lends another to, the second party.

- Cross-currency basis swap agreement (α is the price of the basis swap, agreed upon by the counterparties).



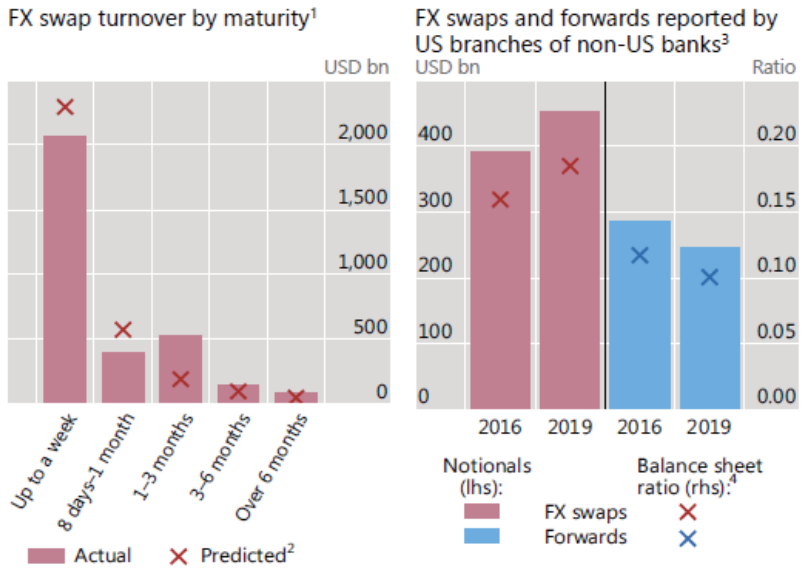
Foreign exchange market turnover by instrument[1]

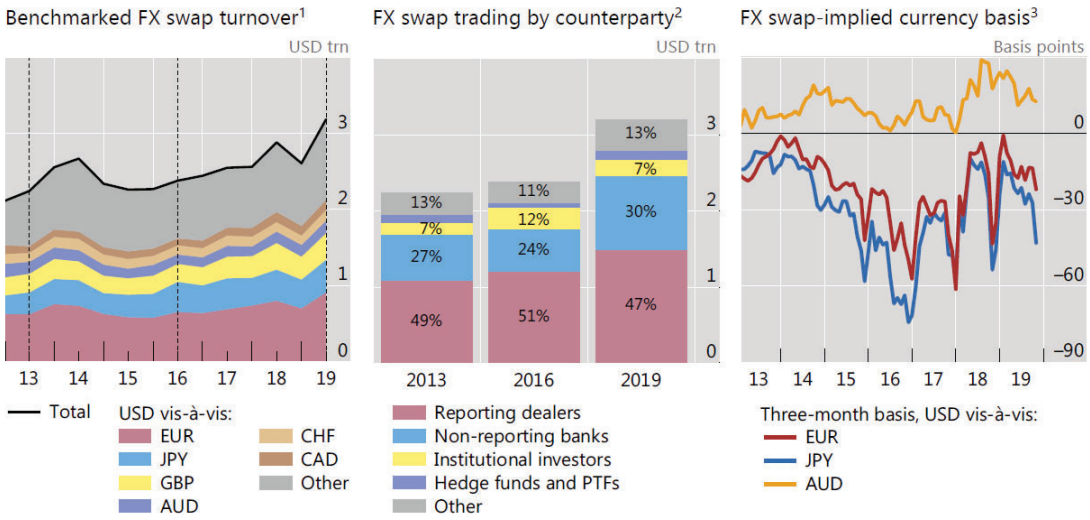
Net-net basis, daily averages in April — Graph 2



[1] Adjusted for local and cross-border inter-dealer double-counting, ie "net-net" basis.

Source: BIS Triennial Central Bank Survey. For additional data by instrument, see Table 1 on page 9.





Negative values indicate that FX swap-implied US dollar rate exceeds US dollar Libor

Futures Contracts

Both forward and futures contracts are **derivative** or **contingent claim securities** because their values are derived from or contingent upon the value of the underlying security

Forward contract

- Tailor-made for a client by their international bank

Futures contract

- **Standardized** features (e.g., contract size, maturity date, delivery months)
- **Exchange traded**

Futures Contracts: Preliminaries 2

An **initial performance bond** (formerly called *margin*) must be deposited into a collateral account to establish a futures position

- Generally equal to 2% of contract value
- Cash or T-bills may be used to meet requirement

Major difference between forward contract and futures contract is the way the underlying asset is priced for future purchase or sale

- Forward contract states a price for the future transaction, but futures contract is **settled-up**, or **marked-to-market**, daily at the **settlement price**

Differences between Futures and Forward Contract

Trading Location
Futures: Traded competitively on organized exchanges.
Forward: Traded by bank dealers via a network of telephones and computerized dealing systems.

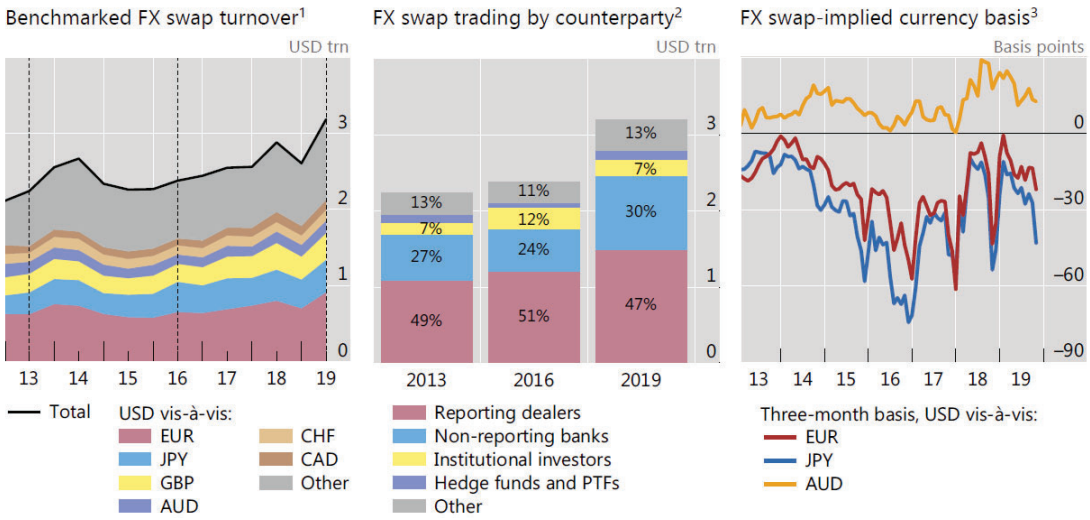
Contractual Size
Futures: Standardized amount of the underlying asset.
Forward: Tailor-made to the needs of the participant.

Settlement
Futures: Daily settlement, or marking-to-market, done by the futures clearinghouse through the participant's performance bond account.
Forward: Participant buys or sells the contractual amount of the underlying asset from the bank at maturity at the forward (contractual) price.

Expiration Date
Futures: Standardized delivery dates.
Forward: Tailor-made delivery date that meets the needs of the investor.

Delivery
Futures: Delivery of the underlying asset is seldom made. Usually a reversing trade is transacted to exit the market.
Forward: Delivery of the underlying asset is commonly made.

Trading Costs
Futures: Bid-ask spread plus broker's commission.
Forward: Bid-ask spread plus indirect bank charges via compensating balance requirements.

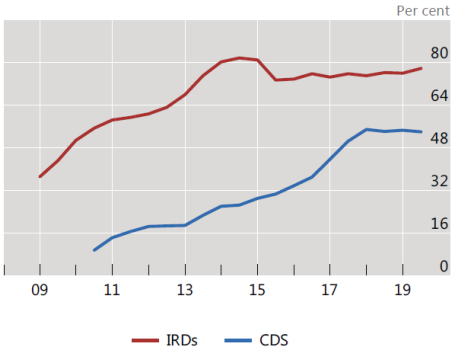


Negative values indicate that FX swap-implied US dollar rate exceeds US dollar Libor

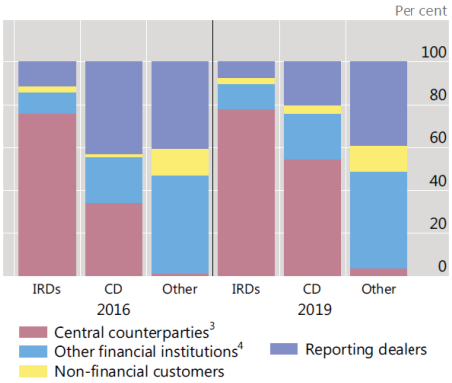
Central clearing advances after the Great Financial Crisis

Notional amounts outstanding — Graph 4

Clearing rates[1]



Notional amounts outstanding,[2] by counterparty and underlying risk

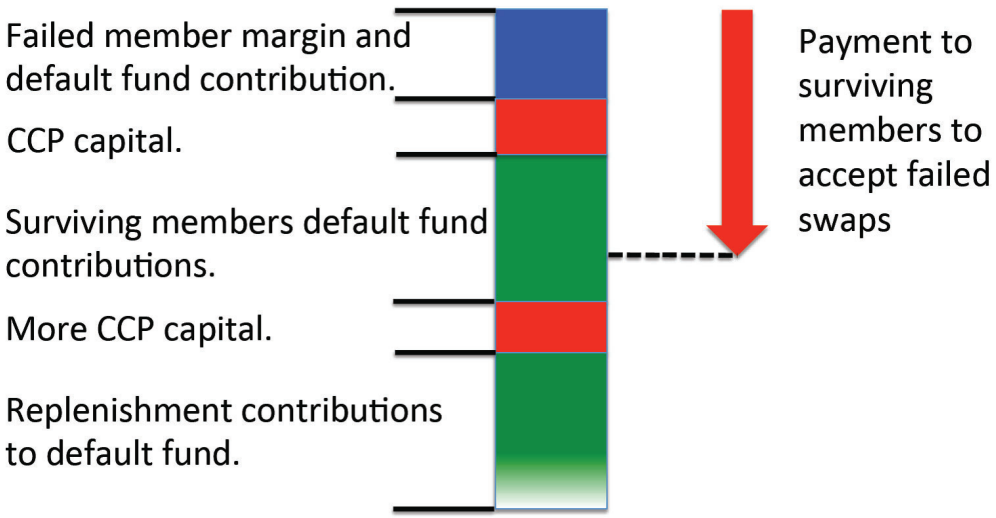


CD = credit derivatives; CDS = credit default swaps; IRDs = interest rate derivatives; other = foreign exchange and equity derivatives.

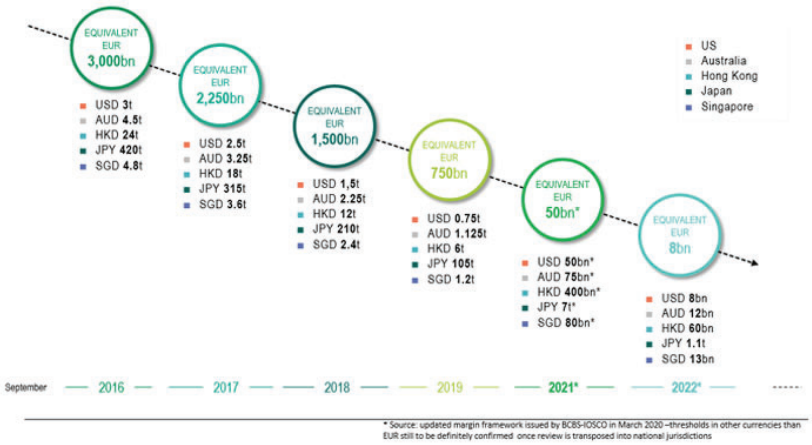
[1] Calculated as a share of notional amounts outstanding reported vis-à-vis CCPs in the total notional amounts outstanding. For IRDs, data for CCPs prior to end-June 2016 are estimated by indexing the amounts reported at end-June 2016 to the growth since 2008 of notional amounts outstanding cleared through LCH's SwapClear service. At half-year end. [2] As a percentage of the notional amount of all outstanding OTC derivatives. As of end-June. [3] Contracts between reporting dealers that are subsequently novated to CCPs are recorded twice. [4] Excluding central counterparties and reporting dealers.

Sources: LCH.Clearnet Group Ltd; BIS derivatives statistics.

CCP Default Management Waterfall



Timeline for Implementation of Margin Requirements for Non-Centrally Cleared Derivatives



timeline depends on firms “aggregate average notional amount” (AANA) of non-centrally cleared derivatives (at consolidated group level).

Which derivatives are covered?

	EUROPE	US	AUSTRALIA	HONG KONG	JAPAN	SINGAPORE
INTEREST RATES DERIVATIVES	✓	✓	✓	✓	✓	✓
CREDIT DERIVATIVES	✓	✓	✓	✓	✓	✓
FOREIGN EXCHANGE (« FX ») DERIVATIVES, EXCEPT:	✓	✓	✓	✓	✓	✓
PHYSICALLY SETTLED FORWARDS	Exempt	Exempt	Exempt	Exempt	Exempt	Exempt
PHYSICALLY SETTLED SWAPS	Exempt	Exempt	Exempt	Exempt	Exempt	Exempt
PRINCIPAL PAYMENTS ON CROSS-CURRENCY SWAPS	Exempt	Exempt	Exempt	Exempt	Exempt	Exempt
EQUITY DERIVATIVES, EXCEPT:	✓	✓	✓	✓	✓	✓
EQUITY SWAPS	✓	✓	✓	✓	✓	Yes from 2020/02/29
EQUITY OPTIONS	Yes from 2020/01/04	Exempt	✓	✓	Yes from 2020/02/29	Yes from 2020/02/29
EQUITY FORWARDS	✓	Exempt	✓	✓	✓	Yes from 2020/02/29
COMMODITY DERIVATIVES, EXCEPT:	✓	✓	✓	Yes under conditions	✓	Yes, only for trades not for commercial purpose
PHYSICALLY SETTLED FORWARDS	Yes under conditions	Exempt	✓	Exempt	Exempt	Yes, only for trades not for commercial purpose
PHYSICALLY SETTLED OPTIONS	Yes under conditions	✓	✓	Exempt	✓	Yes, only for trades not for commercial purpose
OTHERS (e.g weather derivatives)	Yes, if instrument defined as derivatives under MiFid	Yes under CFTC No under SEC	Yes if instrument defined as OTC derivative under local rules			

the **calculation of initial margin** should rely either on:

- a table-based method,
- or on an internal model, with a one-tailed 99% confidence interval over a "margin period of risk" (horizon) of at least 10 days.

Standardised initial margin schedule

Asset class	Initial margin requirement (% of notional exposure)
Credit: 0–2 year duration	2
Credit: 2–5 year duration	5
Credit 5+ year duration	10
Commodity	15
Equity	15
Foreign exchange	6
Interest rate: 0–2 year duration	1
Interest rate: 2–5 year duration	2
Interest rate: 5+ year duration	4
Other	15