CHAPTER 1

Introduction to Foreign Exchange

The foreign exchange market is the market where currencies are traded. A currency is the money of a country. It serves as the country's legal tender, the medium with which debts can be discharged and taxes can be paid.

As a general rule, every country has its own currency, though there are some prominent exceptions. By extension, practically every country has a central bank (DeRosa 2009).

Large money-center banks are the primary dealers in foreign exchange, trading in spot, forward, forward swaps, and options. Central banks are also instrumental to the foreign exchange market, acting as policy agents for their respective governments and as operators of the primary settlements systems. This chapter will introduce the key players, the varieties of transactions, and the important conventions of the marketplace.

DEFINING MONEY

In an international context, we say *currency*, but in a local environment the term is *money*.

Currency, or money, is curious in at least one regard. At its core, it is a creation of a central bank. Monetary economists describe central bank money, or high-powered money, as the sum of currency outstanding and in the hands of the public plus commercial bank deposits (or reserves) held at the central bank. This part of the money supply is state created. Add to this the money that is created privately in the banking system through expansion because of fractional reserve requirements. The implication is that money is a hybrid concept, part state and part private in origin. Mehrling (2013) and DeRosa (2013) recognize this hybridity and call attention to the role of the central bank in establishing pricing parity between state money and private money.

One exception to the one-country, one-currency rule is the euro, established in 1999 and now the common currency of 17 European countries. As of 2013, the euro participants[1] are:

- Austria
- Belgium
- Cyprus
- Estonia
- Finland
- France
- Germany
- Greece
- Ireland
- Italy
- Luxembourg
- Malta
- Netherlands
- Portugal
- Slovak Republic
- Slovenia
- Spain

The euro zone is the primary example of a currency zone. Another is the Central African CFA franc zone. There are also cases of countries that use other countries' currencies, such as Ecuador and Panama, which use the U.S. dollar. Still, the general rule holds that most countries have their own unique currency.

The broader significance of this is that a specific currency is legal tender only in its own country. Therefore, if you buy dollars in exchange for yen, you must receive dollars in the United States and pay yen in Japan. This central fact of foreign exchange has implications that are discussed at length in this book.

An *exchange rate* is the price at which one currency can be exchanged for another.

PARTICIPANTS IN THE FOREIGN EXCHANGE MARKET

The foreign exchange market is the largest component of the international capital market. By this I mean that its traded volumes are substantially larger than those of the international stock and bond markets. Foreign exchange

[1] Monaco, San Marino, and Vatican City use the euro under a formal arrangement with the European Community. Andorra, Kosovo, and Montenegro have unilaterally adopted the euro.

is traded everywhere there is a banking center. A large and diverse group of market participants are active in the foreign exchange market, including:

- Large-scale money-center banks that are marketmaking dealers[2] and the core of the foreign exchange market. They supply the bulk of the liquidity that exists in the market. These banks operate institutional trading rooms in the major money centers, those being London, New York, Tokyo, Singapore, Hong Kong, Zürich, and Sydney.
- Banks and investment banks that engage in international finance and capital markets functions.
- Commercial and merchant banks that use the foreign exchange market as part of their lending and trade finance activities.
- Smaller banks that are customers of the foreign exchange market in the sense that although they initiate transactions, they are not market makers. For the most part, these banks act as intermediaries for clients that have the need to do foreign exchange transactions.
- Hedge funds and other alternative asset management funds that trade the whole range of foreign exchange products. They employ a variety of styles, ranging from very-short-term arbitrage and momentum strategies to long-term strategic positioning to complex options and volatility strategies.
- Other financial institutions that are customers of the foreign exchange market, including insurance companies, thrift institutions, pension funds, endowment funds, mutual funds, and investment management companies.
- Commercial institutions that use foreign exchange, such as credit card companies.
- Corporations and other commercial interests that use foreign exchange in their treasury functions and hedging programs.
- Private individuals who in some instances trade foreign exchange in much the same way and sometimes in comparable sizes as trades done by the largest hedge funds.
- Central banks are instrumental in the foreign exchange market for a variety of reasons.

Some expansion on the multifaceted role of central banks is needed. First, they are the creators of money (in the sense of the monetary base). Second, they are the regulators of the world's banks; as previously mentioned, it is the banks that are the marketmaking dealers in foreign exchange.

[2] A dealer is different from a broker in that the former is a principal in a transaction while the latter is not.

On a different level, central banks execute government exchange rate policies. Specifically, central banks engage in intervention and stabilization initiatives.

One other role is important to this book. Central banks are operators of *Real-Time Gross Settlements* payment systems (Chapter 4). These operations facilitate settlement of domestic funds transfers and, by extension, foreign exchange transactions.

In another regard, some central banks and other related institutions have been known to trade foreign exchange in the fashion of an aggressive speculator or hedge fund. At times some have accumulated large positions in spot, forward, options, or exotic options. These activities are naturally controversial as they confuse the accepted role of a central bank with that of a speculator. Still, the presence of these speculator central banks cannot be dismissed, however counterintuitive their activities may seem.

IDENTIFYING CURRENCIES AND EXCHANGE RATES

Currencies have industry-defined three-letter code identifiers. The following are some examples:

Euro	EUR
Pound sterling	GBP
Australian dollar	AUD
U.S. dollar	USD
Japanese yen	JPY
Swiss franc	CHF

A more comprehensive list of currency identifiers created by the International Standards Organization is contained in the Appendix to this chapter.

Exchange rate pairs also have defined names. For example, EUR/USD refers to the exchange rate for the purchase or sale of euros in exchange for dollars. Another example is USD/JPY, which is the exchange rate for the purchase or sale of dollars in exchange for Japanese yen. These exchange rate names are universal.

The ordering of currencies in a named pair follows a convention. For example, it would not be proper to call the exchange rate "JPY/USD" or "yen/dollar"; the correct name is USD/JPY or "dollar/yen." Likewise it is EUR/USD and never "USD/EUR" (i.e., "euro/dollar" and never "dollar/euro"). The general rule is that the first name in the exchange rate pair is currency that is being bought or sold and in whatever amount. To say "10 million EUR/USD" means a transaction to buy or sell 10 million euros

against dollars. Or to say "20 million USD/JPY" means a transaction to buy or sell $20 million against yen. The rules as to which of two currencies must come first in an exchange rate pair derive from a hierarchy that, while arbitrary, is universal:

Code	Currency Name
EUR	Euro
GBP	Pound sterling
AUD	Australian dollar
NZD	New Zealand dollar
USD	U.S. dollar
CAD	Canadian dollar
CHF	Swiss franc
JPY	Japanese yen

The euro is listed above all other currencies, which means it is always the first currency in an exchange rate pair, and as a consequence it is what is being purchased or sold in the designated amount. The major exchange rates against the euro are EUR/USD, EUR/JPY, EUR/CHF, and EUR/GBP.

The dollar is above the balance of currencies. Hence, it comes first for many currencies, such as the Canadian dollar, the Swiss franc, and the Japanese yen. This is also true for most emerging market currencies, an example being the Thai baht (THB), which trades as USD/THB.

QUOTATION CONVENTIONS

Foreign exchange dealers supply quotations for exchange rates upon demand. A quote consists of a *bid* and an *ask* on a designated quantity of currency. The bid is the price at which the dealer is willing to buy the indicated quantity of currency. The ask is the price at which the dealer is willing to sell the indicated quantity of currency. The mechanics of trading foreign exchange are covered in Chapter 3. For now I will cover some important trading rules.

There are two conventions for giving quotes in trades that involve the U.S. dollar. The euro, the pound sterling, the Australian dollar, and the New Zealand dollar are all quoted "American," meaning the number of dollars and cents it takes to buy one unit of those currencies: A quote on EUR/USD of 1.2052 means that the euro is worth $1.2052. If a trader buys €10 million at this rate, on value date he will receive €10 million in his European bank account and deliver $12,052,000 into an American bank account of his counterparty's choosing.

All other currencies are quoted "European" when traded against the dollar. This means the number of units of foreign currency it takes to buy or sell one dollar. A quotation of 90.50 on USD/JPY means the dollar is worth 90.50 yen. If a trader sells $10 million at this rate, on value day he must deliver $10 million to an account at an American bank of his counterparty's choosing and he will receive ¥905,000,000 in his Japanese bank account.

Exchange rates that do not directly involve the dollar are called cross rates (or crosses). The most important crosses are EUR/JPY, EUR/CHF, and EUR/GBP. Cross rates are linked to dollar exchange rates through *triangular arbitrage*. For example, a trader could buy dollar/yen directly, meaning through USD/JPY (buying dollars and selling yen), or alternatively by going through the cross: Sell euros against dollars (EUR/USD) and buy euros against yen (EUR/JPY). For example, suppose USD/JPY is quoted 90.50–90.52 on $10 million. The first number, 90.50, is the bid, and the second, 90.52, is the ask. Also suppose euro/dollar is quoted 1.2052–1.2054. A party who wished to buy $10 million USD/JPY could buy dollar/yen directly and pay ¥905,200,000. Alternatively, the party could try working through the cross. If euro/yen were quoted 109.09–109.10, the party could sell €8,297,378 for $10 million and then buy the same number of euros at the EUR/JPY ask price of 109.10 to arrive at ¥905,243,943. In this example, the cross would be a more expensive way of buying the dollars. But if the ask of the cross had been .01 lower, 109.09, the $10 million could be acquired for ¥905,160,969. In the normal markets, triangular arbitrage keeps cross rates and dollar rates in close formation.

THE FOREIGN EXCHANGE MARKET

Foreign exchange trading rooms are located in money centers all around the globe. The portion of the foreign exchange market that concerns us here is the *wholesale* market, properly called the Interbank Foreign Exchange Market (this is what I mean by *foreign exchange market*).

The preponderance of trading is between banks in benefit of themselves and their clients.

The foreign exchange market is a 24-hour market that operates during the week and sometimes on weekends and holidays. There are three trading time zones. The foreign exchange week opens Monday at 7 A.M. in New Zealand (Smyth 2007). One hour later, Sidney opens. Later, Tokyo, Hong Kong, and Singapore begin trading to complete the Australasia Time Zone. Next, trading shifts to Europe, where some of the principal centers are Frankfurt, Zurich, Geneva, Paris, and Milan. But London is the dominant center; indeed, it is the largest foreign exchange trading center in the entire world. Hence this bloc is called the London Time Zone. At midday

London time, New York opens for trading. Other cities in North America are active, such as Chicago, San Francisco, Los Angeles, and Toronto, but New York is the main foreign exchange trading location in this time zone (hence this is called the New York Time Zone). The foreign exchange day ends at 5 P.M., but this does not mean the market is closed because, except on Friday, the new day starts immediately. The reason for the New York 5 P.M. close is for booking purposes. Friday's 5 P.M. New York close marks the end of the week, but with the advent of electronic trading it is possible to do some trading over weekends.

Basic Trades

The Bank for International Settlements (BIS 2010) defines four types of foreign exchange transactions[3] that are relevant for our purposes:

1. A *spot* transaction is an agreement to exchange sums of currency at an agreed-upon exchange rate on a value date that is in two bank business days' time.
2. A *forward outright* transaction is an agreement to exchange sums of currency at an agreed-upon exchange rate on a value date that will be in more than two bank business days' time.
3. A *forward swap* consists of a spot transaction plus a forward outright at a different exchange rate in the reverse direction for value beyond spot value.
4. A *currency option* is a put or a call on a quantity of foreign exchange. Options without special features are referred to as *vanilla options*. There are also *exotic options* on foreign exchange that include nonstandard features, such as *knock-out features*.

The volumes traded in the foreign exchange market are simply enormous. The most recent estimates from survey data collected in April 2010 are nearly $4 trillion per day. Exhibit 1.1 contains data from the BIS 2010 Triennial Central Bank Survey of the foreign exchange market prepared and published by the Bank for International Settlements. The BIS survey is the best source of information available on the size of the foreign exchange market. The actual surveys are taken by central banks around the world under the direction of the BIS. The BIS compiles the data and publishes the

[3] The BIS survey also includes currency swaps. It defines a *currency swap* as a "contract which commits two counterparties to exchange streams of interest payments in different currencies for an agreed period of time and usually to exchange principal amounts in different currencies at a pre-agreed exchange rate at maturity" (BIS 2010, p. 32).

EXHIBIT 1.1 Global Foreign Exchange Market Turnover[a]

Daily Averages in April (billions of U.S. dollars)					
Instrument/Maturity	**1998**	**2001**	**2004**	**2007**	**2010**
Foreign exchange instruments	1,527	1,239	1,934	3,324	3,981
Spot transactions[b]	568	386	631	1,005	1,490
Outright forwards[b]	128	130	209	362	475
Up to 7 days	65	51	92	154	219
Over 7 days	62	80	116	208	256
Foreign exchange swaps[b]	734	656	954	1,714	1,765
Up to 7 days	528	451	700	1,329	1,304
Over 7 days	202	204	252	382	459
Currency swaps	10	7	21	31	43
Options and other products[c]	87	60	119	212	207
Memo:					
Turnover at April 2010 exchange rates[d]	1,705	1,505	2,040	3,370	3,981
Estimated gaps in reporting	49	30	116	152	144
Exchange-traded derivatives[e]	11	12	26	80	168

Source: BIS 2010.

[a] Adjusted for local and cross-border inter-dealer double-counting (i.e., "net-net" basis).
[b] Previously classified as part of the so-called "traditional FX market."
[c] The category "other FX products" covers highly leveraged transactions and/or trades whose notional amount is variable and where a decomposition into individual plain-vanilla components was impractical or impossible.
[d] Non–U.S. dollar legs of foreign currency transactions were converted into original currency amounts at average exchange rates for April of each survey year and then reconverted into U.S. dollar amounts at average April 2010 exchange rates.
[e] *Sources:* FOW TRADEdata; Futures Industry Association; various futures and options exchanges. Reported monthly data were converted into daily averages of 20.5 days in 1998, 19.5 days in 2001, 20.5 in 2004, 20 in 2007, and 20 in 2010.

results. Each triennial survey is a snapshot of trading on one specific day in the month of April.

Exhibit 1.1 shows the remarkable expansion in trading between 1998 and 2010. It breaks down trading by type of transaction. The largest category is in short-dated foreign exchange swaps. These trades are used by market participants to postpone immediate settlements by rolling to future value dates. The second largest category is spot transactions. Forward outrights and currency options round out the mix in third and fourth positions, respectively. There are also currency swaps, but they are a small portion of the total market.

Exhibit 1.2 also comes from the BIS survey. It shows the percentage shares of daily volume by currency. The preponderance of trades have the dollar on one side. The vast majority of all trading involves the dollar, the euro,

EXHIBIT 1.2 Currency Distribution of Global Foreign Exchange Market Turnover[a]

	Percentage Shares of Average Daily Turnover in April				
Currency	**1998**	**2001**	**2004**	**2007**	**2010**
U.S. dollar	86.8	89.9	88.0	85.6	84.9
Euro	—	37.9	37.4	37.0	39.1
Japanese yen	21.7	23.5	20.8	17.2	19.0
Pound sterling	11.0	13.0	16.5	14.9	12.9
Australian dollar	3.0	4.3	6.0	6.6	7.6
Swiss franc	7.1	6.0	6.0	6.8	6.4
Canadian dollar	3.5	4.5	4.2	4.3	5.3
Hong Kong dollar	1.0	2.2	1.8	2.7	2.4
Swedish krona	0.3	2.5	2.2	2.7	2.2
New Zealand dollar	0.2	0.6	1.1	1.9	1.6
Korean won	0.2	0.8	1.1	1.2	1.5
Singapore dollar	1.1	1.1	0.9	1.2	1.4
Norwegian krone	0.2	1.5	1.4	2.1	1.3
Mexican peso	0.5	0.8	1.1	1.3	1.3
Indian rupee	0.1	0.2	0.3	0.7	0.9
Russian rouble	0.3	0.3	0.6	0.7	0.9
Chinese renminbi	0.0	0.0	0.1	0.5	0.9
Polish zloty	0.1	0.5	0.4	0.8	0.8
Turkish lira	—	0.0	0.1	0.2	0.7
South African rand	0.4	0.9	0.7	0.9	0.7
Brazilian real	0.2	0.5	0.3	0.4	0.7
Danish krone	0.3	1.2	0.9	0.8	0.6
New Taiwan dollar	0.1	0.3	0.4	0.4	0.5
Hungarian forint	0.0	0.0	0.2	0.3	0.4
Malaysian ringgit	0.0	0.1	0.1	0.1	0.3
Thai baht	0.1	0.2	0.2	0.2	0.2
Czech koruna	0.3	0.2	0.2	0.2	0.2
Philippine peso	0.0	0.0	0.0	0.1	0.2
Chilean peso	0.1	0.2	0.1	0.1	0.2
Indonesian rupiah	0.1	0.0	0.1	0.1	0.2
Israeli new shekel	—	0.1	0.1	0.2	0.2
Colombian peso	—	0.0	0.0	0.1	0.1
Romanian leu	—	—	0.0	0.0	0.1
Saudi riyal	0.1	0.1	0.0	0.1	0.1
Argentine peso	0.1	—	0.0	0.0	0.0
Peruvian nuevo sol	—	0.0	0.0	0.0	0.0
Lithuanian litas	—	—	0.0	0.0	0.0
Other currencies	8.7	6.6	6.5	7.6	4.6
All currencies	**200.0**	**200.0**	**200.0**	**200.0**	**200.0**

Source: BIS 2010.

[a] Because two currencies are involved in each transaction, the sum of the percentage shares of individual currencies totals 200 percent instead of 100 percent. Adjusted for local and cross-border inter-dealer double-counting (i.e., "net-net" basis).

the Japanese yen, the pound sterling, the Australian dollar, the Swiss franc, and the Canadian dollar. This is why foreign exchange is sometimes referred to as a hierarchical market. Other currencies have a much smaller share of the overall market but one must remember that even a small share of a $4 trillion-a-day market can still be a very large number.

Exhibit 1.3 continues with data from the survey on turnover by currency pair. The top three currency pairs account for half of all currency

EXHIBIT 1.3 Global Foreign Exchange Market Turnover by Currency Pair

Daily Averages in April (billions of U.S. dollars and percentages)								
Currency Pair	2001		2004		2007		2010	
	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent
U.S. dollar/euro	372	30%	541	28%	892	27%	1,101	28%
U.S. dollar/yen	250	20%	328	17%	438	13%	568	14%
U.S. dollar/sterling	129	10%	259	13%	384	12%	360	9%
U.S. dollar/Australian dollar	51	4%	107	6%	185	6%	249	6%
U.S. dollar/Swiss franc	59	5%	83	4%	151	5%	168	4%
U.S. dollar/Canadian dollar	54	4%	77	4%	126	4%	182	5%
U.S. dollar/Swedish krona	6	0%	7	0%	57	2%	45	1%
U.S. dollar/other	193	16%	300	16%	612	18%	705	18%
Euro/yen	36	3%	61	3%	86	3%	111	3%
Euro/sterling	27	2%	47	2%	69	2%	109	3%
Euro/Swiss franc	13	1%	30	2%	62	2%	72	2%
Euro/other	22	2%	44	2%	123	4%	162	4%
Other currency pairs	28	2%	50	3%	139	4%	149	4%
All currency pairs	1,240	100%	1,934	100%	3,324	100%	3,981	100%

Source: BIS 2010.

trading: EUR/USD (28%), USD/JPY (14%), and GBP/USD (9%). What emerges from the survey is a picture of a market consisting of massive amounts of trading in the major currency pairs and much smaller amounts of trading in possibly as many as three dozen other minor currency pairs.

FOREIGN EXCHANGE REGIMES

The major currencies have floated against the dollar since 1973 when the Bretton Woods–Smithsonian fixed exchange rate regime collapsed. Intra-European exchange rates were periodically subject to various forms of fixed exchange rate arrangements (such as the European Monetary System's Exchange Rate Mechanism) leading up to the adoption of the euro.

Emerging markets currencies have been the subject of forms of fixed or controlled exchange rate regimes, particularly in the period from 1970 to 2000. The hallmark of these regimes was an initial period of exchange rate stability, one might even say rigidity, followed by dramatic and explosive currency crises. Breakaway movements from exchange rate controls can be breathtakingly violent. Moreover, liquidity can suffer for sustained periods of time. Many of these episodes are recounted in DeRosa (2001, 2009). Exhibit 1.4 shows a list of recent currency crises.

EXHIBIT 1.4 Selected Emerging-Markets Currency Crises, 1994–2002

Country	Date of Onset
Mexico	December 1994
Thailand	July 1997
Philippines	July 1997
Malaysia	July 1997
Indonesia	August 1997
South Korea	December 1997
Russia	August 1998
Brazil	January 1999
Turkey	January 2001
Argentina	January 2002

Source: DeRosa, *Central Banking and Monetary Policy in Emerging Markets Nations*, CFA Institute, 2009.

EXCHANGE RATE CONTROLS

Exchange rate controls are part and parcel with non-floating currency regimes. Sometimes these are lumped in with the general class of capital controls. Exchange rate controls fit into a broad category of efforts by a government or central bank to control the level of its exchange rate, reduce the volatility in fluctuations in its exchange rate, or limit trading or speculation in its currency.

Exchange rate controls can be imposed suddenly. Some of the forms they have taken are:

- Restrictions on short sales or short positions in currencies.
- Onerous reporting requirements on trading.
- Limitations on the size of transactions.
- Requirements that trades be settled at non-market rates.
- Imposition of taxes on foreign exchange transactions.
- Controls on transfers of funds related to specific foreign exchange transactions.
- Restrictions on the settlement of spot and forward transactions.
- Outright price controls that peg an exchange rate at non-market levels.

From an operation's point of view, exchange controls present a source of potentially enormous and possibly unforeseeable risk. The imposition of exchange rate controls can greatly modify the risk of currency positions already on the books of a trading entity. Conventional risk measures do not always have provisions for the types of risks that controls can create.

THE STRUCTURE OF THE FOREIGN EXCHANGE MARKET

The largest money-center banks dominate foreign exchange market making. They are the most important players in the market and are the major sources of liquidity.

Trades occur when one party contacts another for a bid–ask quotation on a currency in a designated size. The party asking for the quotation is called the *aggressor* and the other party, which supplies the quote, is called the *nonaggressor*. The largest foreign exchange–dealing banks have agreements to make quotations to each other on demand. This type of relationship is called a *reciprocal dealing relationship*. Two banks could be the aggressor and nonaggressor, respectively, in a trade at one moment and later be the nonaggressor and aggressor, respectively, in a subsequent trade.

Smaller banks and customers in general have a different arrangement. They may ask dealing banks for quotations, but they are not required to make quotations themselves. This is known as a *nonreciprocal dealing relationship*.

The advent of electronic foreign exchange trading has had a substantial impact on the foreign exchange market in recent years. Electronic trading is believed to be the cause in large part for the remarkable expansion in the size of this market, as was revealed in Exhibit 1.1. Electronic trading has enabled an expansion in the sources of liquidity in the market.

Although the large dealers still account for the bulk of trades, smaller counterparties can enter the marketmaking fray in respect to smaller-sized trades by occasionally posting limit orders to buy or sell.

Electronic trading has also enabled a variety of new trading styles to emerge. One is rapid-fire arbitrage that previously was not technologically feasible. Another is called *algorithmic trading*, a style of trading that seeks to exploit short-term serial correlation in exchange rates. These and other varieties of computerized trading have expanded the size of the market. Indeed, some of the largest dealers run their routine, smaller-scale marketmaking from auto-dealing platforms.

BANKS' IDENTIFICATION CODES

Banks have the major role in the foreign exchange market. They not only do most of the trading but they also settle trades on value dates. Banks need to be easily and unmistakably identified, especially in the settlement process. At least three codifications have been developed. They are the SWIFT/BIC code, the International Bank Number, and the American Bankers Association Routing Number (ABA), all of which are described in the following.

Business Identification Schemes: SWIFT/BIC

The *Business Identifier Code* (BIC) is the most commonly used international identifier of financial institutions. It is a unique identification code for financial institutions and corporations. SWIFT, in its role of ISO (International Organization for Standardization) registration authority, issues BICs to financial and nonfinancial institutions connected to the SWIFT network as well as to non-connected institutions. The BIC is an international standard used as an identifier in financial transactions and client and counterparty databases.

The 8-character BIC, sometimes referred to as a BIC8, consists of an institution code, a country code, and a location code. In addition, a SWIFT user can establish one or more 11-character BICs in order to designate a specific

location, branch, department, business area, or service under its responsibility. The BIC11 will then consist of the BIC8 characters with an additional 3 characters denoting such location, branch, department, and so on.

BIC characters are as follows:

First four characters—constitute the institution code (identifies the institution and consists of alphabetic characters only)

Next two characters—constitute the country code (identifies the country or geographic location of the institution and consists of alphabetic characters only)

Next two characters—constitute the location code (identifies either the region or city, or both, in which the institution is located within a country or geographical location and consists of both alphabetic and numeric characters)

(**For a BIC11**) **Next three characters**—constitute the branch code (represents a branch or a department of geographical, functional, or departmental nature within the same country and consists of both alphabetic and numeric characters)

SWIFT maintains on its website (www.swift.com) a publicly accessible search tool for looking up BICs and the institutions to which they have been assigned.

Bank Identification Schemes: IBAN

IBAN is an acronym for International Bank Account Number. It is a universal method for identifying bank accounts across national borders. It originated in Europe but has spread to other banking systems. An IBAN number contains up to five pieces of information: the country code, the associated country number, the bank code, the sort code (to identify the branch), and the account number. Each IBAN contains a parity check that allows for a numerical comparison using modular 97 arithmetic to verify the authenticity of the entry. The key point is that the IBAN number as a whole can be checked for accuracy by a mathematical algorithm. This feature allows banks to verify the payment address in advance of the transfer of funds.

Bank Identification Schemes: ABA/Routing Numbers

ABA routing numbers were designed by the American Bankers Association in 1910. The Federal Reserve's Fedwire system—one of the key large-value funds-transfer systems—identifies banks by ABA routing numbers.

The ABA number is a nine-digit code. The first two digits correspond to the Federal Reserve district:

01 Boston
02 New York
03 Philadelphia
04 Cleveland
05 Richmond
06 Atlanta
07 Chicago
08 St. Louis
09 Minneapolis
10 Kansas City
11 Dallas
12 San Francisco

The remaining seven digits are further identification of the bank, its assigned check-clearing location, and check digits. ABA numbers must satisfy a simple numerical algorithm that is designed to minimize input errors. The algorithm is as follows:

$$\text{Mod } [3(d_1 + d_4 + d_7) + 7(d_2 + d_5 + d_8) + (d_3 + d_6 + d_9)] = 0$$

THE AUTHORITIES

The foreign exchange market is the least heavily regulated portion of the international capital market. This does not mean that there is no regulation or supervision of the foreign exchange market. There are institutions with varying degrees of authority for this huge market. I covered some of the roles of the central banks earlier in this chapter. Now let's turn to some other authorities as listed here.

- The Bank for International Settlements (BIS) was founded in 1930. It is thought of as a bank for central banks. It performs and publishes economic research on markets, on how payments systems operate, and the general administration of banks. The BIS is the coordinator of the Triennial Survey of the foreign exchange market. The BIS is based in Basle but has two representative offices, one in Hong Kong and the other in Mexico City.

- The Foreign Exchange Committee (FXC) was founded in 1978 and is sponsored by the Federal Reserve Bank of New York. Its objectives include serving as a forum for the discussion of good practices and technical issues in the FX market, fostering improvements in risk management in the FX market, and supporting actions that facilitate greater contractual certainties for all parties active in foreign exchange. The committee includes representatives from banks, other dealers, foreign exchange brokerage firms, other financial entities who transact in the foreign exchange market, and key market infrastructure providers. The Federal Reserve Bank of New York also sponsors the Financial Markets Lawyers Group (FMLG), a group of lawyers from major financial institutions that engage in foreign exchange trading. The FMLG has drafted many of the contract templates used to bind counterparties and document trades. These include the International Currency Option Master Agreement (ICOM) (1997), the International Foreign Exchange Master Agreement (IFEMA) (1997), the International Foreign Exchange and Option Agreement (FEOMA) (1997), and the International Foreign Exchange and Currency Option Master Agreement (IFXCO)[4] (published as of June 1, 2005). These agreements are discussed in detail in Chapter 5.
- The International Swaps and Derivatives Association (ISDA) was founded in 1985 as the International Swap Dealers Association. It subsequently changed its name to the present representation. ISDA has more than 820 members in 57 countries; its membership consists of derivatives dealers, service providers, and end users. ISDA is the author of the Master Agreement that bears its name. It also created template contracts for credit agreements and a variety of other contractual agreements that are ubiquitous in the foreign exchange market. These are discussed in Chapter 5.
- The Committee on Payment and Settlement Systems (CPSS) was created by the central banks of the Group of Ten (G-10) nations. It has had a large role in the development of modern payment systems and settlement protocols. The CPSS was the sponsor of the Angell (BIS 1989), Allsopp (BIS 1996), Noël (BIS 1993), Lamfalussy (BIS 1990), and Sweet (BIS 1998) reports as well as several other studies about reform of the settlement systems (discussed Chapter 4).
- The Society for Worldwide Interbank Financial Telecommunication SCRL (SWIFT) is a member-owned cooperative that was founded in 1973 to establish and operate a proprietary financial messaging network through which the international financial community is able to conduct business operations with speed and certainty, using standardized messages. More than 10,000 financial institutions and corporations in

[4]The acronym IFXCO is pronounced "eye-fex-co."

212 countries use the SWIFT network to exchange millions of standardized financial messages on a daily basis. SWIFT messaging is ubiquitous in foreign exchange markets. SWIFT messages are used to carry out and confirm transactions and effectuate funds transfers. The community of SWIFT users also serves as a vehicle for the development of global financial messaging standards and practices.

- The Emerging Markets Trading Association (EMTA) was formed in 1990 as a trade group for emerging markets traders and investors. It describes its mission as "promoting the orderly development of fair, efficient and transparent trading markets for emerging markets instruments and to help integrate the emerging markets into the global capital markets." This includes the portion of the foreign exchange market for emerging markets currency pairs. EMTA has had a role in developing many of the foreign exchange markets contract templates, including the IFXCO and FEOMA.
- The Association Cambiste Internationale (ACI) was founded in Paris in 1955 as the Forex Club. Its members are in large part engaged in trading foreign exchange, interest rate products and other securities, banknotes and bullion, precious metals, and commodities and their various kinds of derivatives. ACI contributes to market development through education and certification, development of market practices, and rendering of technical advice. In 1995, ACI changed its name to ACI—The Financial Markets Association.
- The International Monetary Fund (IMF) is concerned with all aspects of exchange rates, but its focus is on foreign exchange regimes and movements of exchange rates.
- The Group of Seven Industrial Nations (G-7) and extensions thereof are interested in foreign exchange but mostly in the levels of exchange rates and their volatility.

SPOT FOREIGN EXCHANGE DEALS

A spot foreign exchange deal is a transaction between two counterparties to exchange sums of currencies on a value day in two bank business days' time.[5]

The term *currency pair* is another name for an exchange rate. This term highlights the fact that all foreign exchange transactions are simultaneously the purchase of one currency and the sale of another.

[5] Some Middle Eastern currencies trade for broken settlement. For example, a trade in the dollar/Saudi riyal executed on Wednesday might settle dollars on Friday and riyals on Saturday.

A series of conventions govern trading in foreign exchange. These conventions are the same virtually everywhere that foreign exchange is traded.

Earlier we saw that quotes are given in foreign exchange in the form of a bid (the dealer buys) and an ask (the dealer sells). A quote is actionable, meaning that it comes in some form from a dealer who is standing ready to either buy or sell at his counterparty's choice. In practice, a dealer expects the counterparty to respond at once, either by buying or selling or by passing on the quotation.

With the advent of electronic trading, bids and asks have come closer to each other. In other words, the *bid–ask spread*, or the difference between the bid and the ask, has narrowed. However, bid–ask spreads have been known to suddenly widen during periods of volatility and general lack of liquidity.

Until recently, each spot foreign exchange rate was quoted to a defined number of decimal digits. The euro and the pound sterling are quoted to four decimal digits against the dollar. The Japanese yen is quoted to two decimal digits against the dollar. The term *pip* refers to one decimal digit of quotation. For example, if dollar/yen moved from 90.50 to 90.51, it would be said to have moved by one pip. Similarly, if euro/dollar moved from 1.2052 to 1.2053, it would have moved by one pip.

As the foreign exchange market has become larger, and particularly with the advent of electronic trading, exchange rates can be quoted to additional decimal digits of precision. The definition of one pip, however, has not changed.

Physical settlement of a spot foreign exchange transaction consists of two payments, each of which is likely to be performed in a different country. This is because each country has its own currency as its form of legal tender. (A prominent exception to this is the euro zone. Settlement of foreign exchange deals in the euro zone is discussed in Chapter 4.)

PROFIT AND LOSS ON A SIMPLE TRADE

Suppose that one of the trades illustrated earlier actually took place: A trader buys $10 million spot against yen at 90.52 from a dealer. This would mean he would receive $10 million in an account in a U.S. bank on value date (in two days' time). It also means he must deliver 905,200,000 yen ($10 million multiplied by 90.52) to the other party's bank in Japan on the same date. Perhaps the dollar's bid rises to 90.75 in the course of the same trading day and the trader decides to unwind the trade. How could this be accomplished and what would be the profit? A second transaction would have to be done, meaning one to sell dollars and buy yen—but how many dollars and how much yen? If the trader sells exactly $10 million dollars,

there will be a residual in yen, representing the profit. This can be seen in the following illustration:

Exchange Rate	Dollars	Yen
90.52	+$10,000,000	–905,200,000
90.75	–$10,000,000	+907,500,000
	0	2,300,000

The yen is shown as a negative quantity in the first trade because the trader must deliver that currency. Alternatively, if the trader does the second trade by selling dollars in the amount equivalent to the original 905,200,000 yen, the residual profit will be denominated in dollars:

Exchange Rate	Dollars	Yen
90.52	+$10,000,000	–905,200,000
90.75	–$ 9,974,655	+905,200,000
	$25,345	0

The choice of which way to close the trade is up to the trader's preference of currency for taking profits.

Note that this example assumes both trades are being done for the same value day. Also note that the profit will be "paid" on the value day, not the trade day.

VALUE DATES

The term *value date* means the date on which a foreign exchange transaction settles. A value date cannot be a bank holiday in either country whose currencies are being traded and it cannot be a bank holiday in New York City. The European Central Bank has declared six days as bank holidays for the euro zone:

New Year's Day
Easter Monday
Good Friday
May 1
Christmas Day
Boxing Day (December 26)

However, each country has its own bank holidays. The commercial website www.goodbusinessday.com is an industry-standard source used to find value days across countries. There is also a calendar called the *Euro Market Day Finder* (published by Copp Clark) that contains worldwide information on value days.

Sometimes, foreign exchange documentation refers to the business day convention. The *1998 FX and Currency Options Definitions* defines the *business day convention* as a procedure for adjusting any relevant date if it would otherwise fall on a day that is not a business day.

In common foreign exchange parlance a *Business Day* is a day when banks can make delivery of currency via electronic funds transfers. A more formal definition is contained in the *1998 FX and Currency Options Definitions*. There are also definitions of some alternative business day conventions:

1. If "Following" [Business Day] is specified, that date will be the first following day that is a Business Day;
2. If "Modified Following" or "Modified" is specified, that date will be the first following day that is a Business Day unless that day falls in the next calendar month, in which case that date will be the first preceding day that is a Business Day;
3. If "Nearest" is specified, that date will be the first preceding day that is a Business Day, if the relevant date otherwise falls on a day other than a Sunday or a Monday, and will be the first following day that is a Business Day, if the relevant date otherwise falls on a Sunday or a Monday; and
4. If "Preceding" is specified, that date will be the first preceding day that is a Business Day.

FORWARD FOREIGN EXCHANGE AND COVERED INTEREST PARITY

A *forward foreign exchange transaction* is a deal done between counterparties agreeing to the exchange of currencies on a value date further out on the calendar than the spot value date. Forward value dates must be valid future spot value dates in the respective currencies. The exchange rate for a forward transaction is called the *forward outright*.

The relationship between the forward outright and spot exchange rate is governed by an economic relationship called the *covered interest parity theorem* (DeRosa 2011). This relationship states that the difference between the forward outright and the spot exchange rate for a given forward value date encapsulates the gap between the interest rates of the two currencies.

When exchange rates are allowed to float freely, each currency can have its own independent constellation of interest rates for various value dates. At a given spot exchange rate there is a schedule of forward outrights corresponding to each future value date. If the no-arbitrage principle holds, each forward outright must obey the interest parity theorem.

The forward outright for a given value date is often quoted in terms of forward points. The forward points for a given forward value date are added or subtracted from the spot rate to obtain the relevant forward outright. Suppose that the USD/JPY spot exchange rate is quoted 90.52–90.54. Also suppose the forward points are quoted –.32 – –.31, which would make the forward outright bid and ask:

	Bid	Ask
Spot	90.52	90.54
Forward points	– 0.32	– 0.31
Outright	90.20	90.23

FORWARD SWAPS

A *forward foreign exchange swap* is a combination of a spot transaction and a forward outright done simultaneously but in opposite directions. The usual purpose of a forward swap is to roll the value date of a position to a future spot value date. Forward swaps trading is the largest portion of the foreign exchange market.

It may be useful to revisit the dollar/yen trade in the previous numerical example. Suppose that instead of unwinding the trade and taking profits, the intention is to continue with the trade and extend the value date by one month. The original trade was a purchase of $10 million at 90.52 against 905,200,000 yen. I will call the trade date day 0 and the value date day 2. Suppose on the same trade day the spot rises to 90.60–90.62. The forward swap could be done without crossing the spot trader's bid–ask spread. Both legs could be done at "spot" 90.61 and forward 90.30 (assuming forward points of –0.31):

	Original	Forward Swap	
Trade Name	**Spot**	**Spot**	**Forward**
Value date	day 2	day 2	day 32
Exchange rate	90.52	90.61	90.30
Dollars	$10,000,000	–$10,000,000	$10,000,000
Yen	–905,200,000	906,100,000	–903,000,000

The effect of the roll is twofold. First, a 900,000 yen profit will be delivered on day 2. Second, the trader now has a new position long $10 million against yen at 90.30 for value in one month.

NON-DELIVERABLE FORWARDS

There is a special category of forward foreign exchange transactions called *non-deliverable forwards* (NDF). These transactions are commonly employed in situations where a central bank or government has imposed some form of capital controls, typically intending to interrupt trading in a currency. The initial transaction is established at a forward rate. A notional size for the transaction is established on trade date. On value date, one of the parties acting as the calculation agent makes an observation of the spot exchange rate, which becomes the settlement rate. Thereupon a formula determines which party owes how much to the other. Here are two examples.

First, assume the currency being bought or sold is quoted American style, in the fashion of the euro. The payment at the end of the contract will be equal to

$$\text{Notional} \times (\text{Settlement} - \text{Forward})$$

This equation assumes that the notional amount is quoted in terms of the foreign currency. For example, suppose the NDF is a contract to buy 10 million Australian dollars forward at 0.5000. At settlement the rate is 0.5500. The holder of the contract would receive a payment in U.S. dollars of $500,000.

In the second example, assume the currency is quoted European, in the fashion of the Swiss franc or the yen. The settlement equation is

$$\text{Notional} \times (1 - \text{Forward}/\text{Settlement})$$

The notional amount here is quoted in domestic currency. For example, suppose a non-deliverable forward were transacted to sell $10 million against Korean won at the forward rate of 1,130.00. If the observed spot exchange rate at settlement were 1,100.00, the dollar seller (won buyer) would be paid $272,727.

SUMMARY

The foreign exchange market has undergone tremendous change since the abandonment of the Bretton Woods and Smithsonian Agreements in the

early 1970s. The electronic trading revolution has been another impetitus for the development of this market, as we will see in the chapters that follow. Nonetheless, the players, varieties of trades, conventions, and at least some aspects of the culture of the market have not significantly changed throughout this four-decade long metamorphosis.

Looking forward, the next chapter will cover basic materials on currency options. The next chapter describes actual foreign exchange and the process of documenting trades. Chapter 4 covers the processes by which trades are settled. Chapter 5 lays out the primary contracts that bind counterparties, called *master agreements*. Chapter 6 covers credit and margin, and Chapter 7, the final chapter, foreign exchange prime brokerage.

APPENDIX 1.1: ISO CURRENCY CODES

ENTITY	Currency	Alphabetic Code	Numeric Code	Minor unit
AFGHANISTAN	Afghani	AFN	971	2
ÅLAND ISLANDS	Euro	EUR	978	2
ALBANIA	Lek	ALL	008	2
ALGERIA	Algerian Dinar	DZD	012	2
AMERICAN SAMOA	U.S. Dollar	USD	840	2
ANDORRA	Euro	EUR	978	2
ANGOLA	Kwanza	AOA	973	2
ANGUILLA	East Caribbean Dollar	XCD	951	2
ANTARCTICA	No universal currency			
ANTIGUA AND BARBUDA	East Caribbean Dollar	XCD	951	2
ARGENTINA	Argentine Peso	ARS	032	2
ARMENIA	Armenian Dram	AMD	051	2
ARUBA	Aruban Florin	AWG	533	2
AUSTRALIA	Australian Dollar	AUD	036	2
AUSTRIA	Euro	EUR	978	2
AZERBAIJAN	Azerbaijanian Manat	AZN	944	2
BAHAMAS	Bahamian Dollar	BSD	044	2
BAHRAIN	Bahraini Dinar	BHD	048	3
BANGLADESH	Taka	BDT	050	2

(*Continued*)

ENTITY	Currency	Alphabetic Code	Numeric Code	Minor unit
BARBADOS	Barbados Dollar	BBD	052	2
BELARUS	Belarussian Ruble	BYR	974	0
BELGIUM	Euro	EUR	978	2
BELIZE	Belize Dollar	BZD	084	2
BENIN	CFA Franc BCEAO	XOF	952	0
BERMUDA	Bermudian Dollar	BMD	060	2
BHUTAN	Ngultrum	BTN	064	2
BHUTAN	Indian Rupee	INR	356	2
BOLIVIA, PLURINATIONAL STATE OF	Boliviano	BOB	068	2
BOLIVIA, PLURINATIONAL STATE OF	Mvdol	BOV	984	2
BONAIRE, SINT EUSTATIUS AND SABA	U.S. Dollar	USD	840	2
BOSNIA AND HERZEGOVINA	Convertible Mark	BAM	977	2
BOTSWANA	Pula	BWP	072	2
BOUVET ISLAND	Norwegian Krone	NOK	578	2
BRAZIL	Brazilian Real	BRL	986	2
BRITISH INDIAN OCEAN TERRITORY	U.S. Dollar	USD	840	2
BRUNEI DARUSSALAM	Brunei Dollar	BND	096	2
BULGARIA	Bulgarian Lev	BGN	975	2
BURKINA FASO	CFA Franc BCEAO	XOF	952	0
BURUNDI	Burundi Franc	BIF	108	0
CAMBODIA	Riel	KHR	116	2
CAMEROON	CFA Franc BEAC	XAF	950	0
CANADA	Canadian Dollar	CAD	124	2
CAPE VERDE	Cape Verde Escudo	CVE	132	2
CAYMAN ISLANDS	Cayman Islands Dollar	KYD	136	2
CENTRAL AFRICAN REPUBLIC	CFA Franc BEAC	XAF	950	0
CHAD	CFA Franc BEAC	XAF	950	0

ENTITY	Currency	Alphabetic Code	Numeric Code	Minor unit
CHILE	Unidades de fomento	CLF	990	0
CHILE	Chilean Peso	CLP	152	0
CHINA	Yuan Renminbi	CNY	156	2
CHRISTMAS ISLAND	Australian Dollar	AUD	036	2
COCOS (KEELING) ISLANDS	Australian Dollar	AUD	036	2
COLOMBIA	Colombian Peso	COP	170	2
COLOMBIA	Unidad de Valor Real	COU	970	2
COMOROS	Comoro Franc	KMF	174	0
CONGO	CFA Franc BEAC	XAF	950	0
CONGO, THE DEMOCRATIC REPUBLIC OF	Congolese Franc	CDF	976	2
COOK ISLANDS	New Zealand Dollar	NZD	554	2
COSTA RICA	Costa Rican Colon	CRC	188	2
CÔTE D'IVOIRE	CFA Franc BCEAO	XOF	952	0
CROATIA	Croatian Kuna	HRK	191	2
CUBA	Peso Convertible	CUC	931	2
CUBA	Cuban Peso	CUP	192	2
CURAÇAO	Netherlands Antillean Guilder	ANG	532	2
CYPRUS	Euro	EUR	978	2
CZECH REPUBLIC	Czech Koruna	CZK	203	2
DENMARK	Danish Krone	DKK	208	2
DJIBOUTI	Djibouti Franc	DJF	262	0
DOMINICA	East Caribbean Dollar	XCD	951	2
DOMINICAN REPUBLIC	Dominican Peso	DOP	214	2
ECUADOR	U.S. Dollar	USD	840	2
EGYPT	Egyptian Pound	EGP	818	2
EL SALVADOR	El Salvador Colon	SVC	222	2
EL SALVADOR	U.S. Dollar	USD	840	2
EQUATORIAL GUINEA	CFA Franc BEAC	XAF	950	0

(*Continued*)

ENTITY	Currency	Alphabetic Code	Numeric Code	Minor unit
ERITREA	Nakfa	ERN	232	2
ESTONIA	Euro	EUR	978	2
ETHIOPIA	Ethiopian Birr	ETB	230	2
EUROPEAN UNION	Euro	EUR	978	2
FALKLAND ISLANDS (MALVINAS)	Falkland Islands Pound	FKP	238	2
FAROE ISLANDS	Danish Krone	DKK	208	2
FIJI	Fiji Dollar	FJD	242	2
FINLAND	Euro	EUR	978	2
FRANCE	Euro	EUR	978	2
FRENCH GUIANA	Euro	EUR	978	2
FRENCH POLYNESIA	CFP Franc	XPF	953	0
FRENCH SOUTHERN TERRITORIES	Euro	EUR	978	2
GABON	CFA Franc BEAC	XAF	950	0
GAMBIA	Dalasi	GMD	270	2
GEORGIA	Lari	GEL	981	2
GERMANY	Euro	EUR	978	2
GHANA	Ghana Cedi	GHS	936	2
GIBRALTAR	Gibraltar Pound	GIP	292	2
GREECE	Euro	EUR	978	2
GREENLAND	Danish Krone	DKK	208	2
GRENADA	East Caribbean Dollar	XCD	951	2
GUADELOUPE	Euro	EUR	978	2
GUAM	U.S. Dollar	USD	840	2
GUATEMALA	Quetzal	GTQ	320	2
GUERNSEY	Pound Sterling	GBP	826	2
GUINEA	Guinea Franc	GNF	324	0
GUINEA-BISSAU	CFA Franc BCEAO	XOF	952	0
GUYANA	Guyana Dollar	GYD	328	2
HAITI	Gourde	HTG	332	2
HAITI	U.S. Dollar	USD	840	2

ENTITY	Currency	Alphabetic Code	Numeric Code	Minor unit
HEARD ISLAND AND McDONALD ISLANDS	Australian Dollar	AUD	036	2
HOLY SEE (VATICAN CITY STATE)	Euro	EUR	978	2
HONDURAS	Lempira	HNL	340	2
HONG KONG	Hong Kong Dollar	HKD	344	2
HUNGARY	Forint	HUF	348	2
ICELAND	Iceland Krona	ISK	352	0
INDIA	Indian Rupee	INR	356	2
INDONESIA	Rupiah	IDR	360	2
INTERNATIONAL MONETARY FUND (IMF)	SDR (Special Drawing Right)	XDR	960	N.A.
IRAN, ISLAMIC REPUBLIC OF	Iranian Rial	IRR	364	2
IRAQ	Iraqi Dinar	IQD	368	3
IRELAND	Euro	EUR	978	2
ISLE OF MAN	Pound Sterling	GBP	826	2
ISRAEL	New Israeli Sheqel	ILS	376	2
ITALY	Euro	EUR	978	2
JAMAICA	Jamaican Dollar	JMD	388	2
JAPAN	Yen	JPY	392	0
JERSEY	Pound Sterling	GBP	826	2
JORDAN	Jordanian Dinar	JOD	400	3
KAZAKHSTAN	Tenge	KZT	398	2
KENYA	Kenyan Shilling	KES	404	2
KIRIBATI	Australian Dollar	AUD	036	2
KOREA, DEMOCRATIC PEOPLE'S REPUBLIC OF	North Korean Won	KPW	408	2
KOREA, REPUBLIC OF	Won	KRW	410	0
KUWAIT	Kuwaiti Dinar	KWD	414	3
KYRGYZSTAN	Som	KGS	417	2
LAO PEOPLE'S DEMOCRATIC REPUBLIC	Kip	LAK	418	2

(*Continued*)

ENTITY	Currency	Alphabetic Code	Numeric Code	Minor unit
LATVIA	Latvian Lats	LVL	428	2
LEBANON	Lebanese Pound	LBP	422	2
LESOTHO	Loti	LSL	426	2
LESOTHO	Rand	ZAR	710	2
LIBERIA	Liberian Dollar	LRD	430	2
LIBYA	Libyan Dinar	LYD	434	3
LIECHTENSTEIN	Swiss Franc	CHF	756	2
LITHUANIA	Lithuanian Litas	LTL	440	2
LUXEMBOURG	Euro	EUR	978	2
MACAO	Pataca	MOP	446	2
MACEDONIA, THE FORMER YUGOSLAV REPUBLIC OF	Denar	MKD	807	2
MADAGASCAR	Malagasy Ariary	MGA	969	2
MALAWI	Kwacha	MWK	454	2
MALAYSIA	Malaysian Ringgit	MYR	458	2
MALDIVES	Rufiyaa	MVR	462	2
MALI	CFA Franc BCEAO	XOF	952	0
MALTA	Euro	EUR	978	2
MARSHALL ISLANDS	U.S. Dollar	USD	840	2
MARTINIQUE	Euro	EUR	978	2
MAURITANIA	Ouguiya	MRO	478	2
MAURITIUS	Mauritius Rupee	MUR	480	2
MAYOTTE	Euro	EUR	978	2
MEMBER COUNTRIES OF THE AFRICAN DEVELOPMENT BANK GROUP	ADB Unit of Account	XUA	965	N.A.
MEXICO	Mexican Peso	MXN	484	2
MEXICO	Mexican Unidad de Inversion (UDI)	MXV	979	2
MICRONESIA, FEDERATED STATES OF	U.S. Dollar	USD	840	2

ENTITY	Currency	Alphabetic Code	Numeric Code	Minor unit
MOLDOVA, REPUBLIC OF	Moldovan Leu	MDL	498	2
MONACO	Euro	EUR	978	2
MONGOLIA	Tugrik	MNT	496	2
MONTENEGRO	Euro	EUR	978	2
MONTSERRAT	East Caribbean Dollar	XCD	951	2
MOROCCO	Moroccan Dirham	MAD	504	2
MOZAMBIQUE	Mozambique Metical	MZN	943	2
MYANMAR	Kyat	MMK	104	2
NAMIBIA	Namibia Dollar	NAD	516	2
NAMIBIA	Rand	ZAR	710	2
NAURU	Australian Dollar	AUD	036	2
NEPAL	Nepalese Rupee	NPR	524	2
NETHERLANDS	Euro	EUR	978	2
NEW CALEDONIA	CFP Franc	XPF	953	0
NEW ZEALAND	New Zealand Dollar	NZD	554	2
NICARAGUA	Cordoba Oro	NIO	558	2
NIGER	CFA Franc BCEAO	XOF	952	0
NIGERIA	Naira	NGN	566	2
NIUE	New Zealand Dollar	NZD	554	2
NORFOLK ISLAND	Australian Dollar	AUD	036	2
NORTHERN MARIANA ISLANDS	U.S. Dollar	USD	840	2
NORWAY	Norwegian Krone	NOK	578	2
OMAN	Rial Omani	OMR	512	3
PAKISTAN	Pakistan Rupee	PKR	586	2
PALAU	U.S. Dollar	USD	840	2
PALESTINE, STATE OF	No universal currency			
PANAMA	Balboa	PAB	590	2
PANAMA	U.S. Dollar	USD	840	2
PAPUA NEW GUINEA	Kina	PGK	598	2

(*Continued*)

ENTITY	Currency	Alphabetic Code	Numeric Code	Minor unit
PARAGUAY	Guarani	PYG	600	0
PERU	Nuevo Sol	PEN	604	2
PHILIPPINES	Philippine Peso	PHP	608	2
PITCAIRN	New Zealand Dollar	NZD	554	2
POLAND	Zloty	PLN	985	2
PORTUGAL	Euro	EUR	978	2
PUERTO RICO	U.S. Dollar	USD	840	2
QATAR	Qatari Rial	QAR	634	2
RÉUNION	Euro	EUR	978	2
ROMANIA	New Romanian Leu	RON	946	2
RUSSIAN FEDERATION	Russian Ruble	RUB	643	2
RWANDA	Rwanda Franc	RWF	646	0
SAINT BARTHÉLEMY	Euro	EUR	978	2
SAINT HELENA, ASCENSION AND TRISTAN DA CUNHA	Saint Helena Pound	SHP	654	2
SAINT KITTS AND NEVIS	East Caribbean Dollar	XCD	951	2
SAINT LUCIA	East Caribbean Dollar	XCD	951	2
SAINT MARTIN (FRENCH PART)	Euro	EUR	978	2
SAINT PIERRE AND MIQUELON	Euro	EUR	978	2
SAINT VINCENT AND THE GRENADINES	East Caribbean Dollar	XCD	951	2
SAMOA	Tala	WST	882	2
SAN MARINO	Euro	EUR	978	2
SAO TOME AND PRINCIPE	Dobra	STD	678	2
SAUDI ARABIA	Saudi Riyal	SAR	682	2
SENEGAL	CFA Franc BCEAO	XOF	952	0
SERBIA	Serbian Dinar	RSD	941	2
SEYCHELLES	Seychelles Rupee	SCR	690	2
SIERRA LEONE	Leone	SLL	694	2

ENTITY	Currency	Alphabetic Code	Numeric Code	Minor unit
SINGAPORE	Singapore Dollar	SGD	702	2
SINT MAARTEN (DUTCH PART)	Netherlands Antillean Guilder	ANG	532	2
SISTEMA UNITARIO DE COMPENSACION REGIONAL DE PAGOS "SUCRE"	Sucre	XSU	994	N.A.
SLOVAKIA	Euro	EUR	978	2
SLOVENIA	Euro	EUR	978	2
SOLOMON ISLANDS	Solomon Islands Dollar	SBD	090	2
SOMALIA	Somali Shilling	SOS	706	2
SOUTH AFRICA	Rand	ZAR	710	2
SOUTH GEORGIA AND THE SOUTH SANDWICH ISLANDS	No universal currency			
SOUTH SUDAN	South Sudanese Pound	SSP	728	2
SPAIN	Euro	EUR	978	2
SRI LANKA	Sri Lanka Rupee	LKR	144	2
SUDAN	Sudanese Pound	SDG	938	2
SURINAME	Surinam Dollar	SRD	968	2
SVALBARD AND JAN MAYEN	Norwegian Krone	NOK	578	2
SWAZILAND	Lilangeni	SZL	748	2
SWEDEN	Swedish Krona	SEK	752	2
SWITZERLAND	WIR Euro	CHE	947	2
SWITZERLAND	Swiss Franc	CHF	756	2
SWITZERLAND	WIR Franc	CHW	948	2
SYRIAN ARAB REPUBLIC	Syrian Pound	SYP	760	2
TAIWAN, PROVINCE OF CHINA	New Taiwan Dollar	TWD	901	2
TAJIKISTAN	Somoni	TJS	972	2

(*Continued*)

ENTITY	Currency	Alphabetic Code	Numeric Code	Minor unit
TANZANIA, UNITED REPUBLIC OF	Tanzanian Shilling	TZS	834	2
THAILAND	Baht	THB	764	2
TIMOR-LESTE	U.S. Dollar	USD	840	2
TOGO	CFA Franc BCEAO	XOF	952	0
TOKELAU	New Zealand Dollar	NZD	554	2
TONGA	Pa'anga	TOP	776	2
TRINIDAD AND TOBAGO	Trinidad and Tobago Dollar	TTD	780	2
TUNISIA	Tunisian Dinar	TND	788	3
TURKEY	Turkish Lira	TRY	949	2
TURKMENISTAN	Turkmenistan New Manat	TMT	934	2
TURKS AND CAICOS ISLANDS	U.S. Dollar	USD	840	2
TUVALU	Australian Dollar	AUD	036	2
UGANDA	Uganda Shilling	UGX	800	0
UKRAINE	Hryvnia	UAH	980	2
UNITED ARAB EMIRATES	UAE Dirham	AED	784	2
UNITED KINGDOM	Pound Sterling	GBP	826	2
UNITED STATES	U.S. Dollar	USD	840	2
UNITED STATES	U.S. Dollar (Next day)	USN	997	2
UNITED STATES	U.S. Dollar (Same day)	USS	998	2
UNITED STATES MINOR OUTLYING ISLANDS	U.S. Dollar	USD	840	2
URUGUAY	Uruguay Peso en Unidades Indexadas (URUIURUI)	UYI	940	0
URUGUAY	Peso Uruguayo	UYU	858	2
UZBEKISTAN	Uzbekistan Sum	UZS	860	2
VANUATU	Vatu	VUV	548	0
Vatican City State (HOLY SEE)	Euro	EUR	978	2

ENTITY	Currency	Alphabetic Code	Numeric Code	Minor unit
VENEZUELA, BOLIVARIAN REPUBLIC OF	Bolivar	VEF	937	2
VIET NAM	Dong	VND	704	0
VIRGIN ISLANDS (BRITISH)	U.S. Dollar	USD	840	2
VIRGIN ISLANDS (US)	U.S. Dollar	USD	840	2
WALLIS AND FUTUNA	CFP Franc	XPF	953	0
WESTERN SAHARA	Moroccan Dirham	MAD	504	2
YEMEN	Yemeni Rial	YER	886	2
ZAMBIA	Zambian Kwacha	ZMW	967	2
ZIMBABWE	Zimbabwe Dollar	ZWL	932	2
ZZ01_Bond Markets Unit European_EURCO	Bond Markets Unit European Composite Unit (EURCO)	XBA	955	N.A.
ZZ02_Bond Markets Unit European_EMU-6	Bond Markets Unit European Monetary Unit (E.M.U.-6)	XBB	956	N.A.
ZZ03_Bond Markets Unit European_EUA-9	Bond Markets Unit European Unit of Account 9 (E.U.A.-9)	XBC	957	N.A.
ZZ04_Bond Markets Unit European_EUA-17	Bond Markets Unit European Unit of Account 17 (E.U.A.-17)	XBD	958	N.A.
ZZ05_UIC-Franc	UIC-Franc	XFU	Nil	N.A.
ZZ06_Testing_Code	Codes specifically reserved for testing purposes	XTS	963	N.A.
ZZ07_No_Currency	The codes assigned for transactions where no currency is involved	XXX	999	N.A.
ZZ08_Gold	Gold	XAU	959	N.A.
ZZ09_Palladium	Palladium	XPD	964	N.A.
ZZ10_Platinum	Platinum	XPT	962	N.A.
ZZ11_Silver	Silver	XAG	961	N.A.

Source: International Standards Organization ISO 4217: 2008.

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