Chapter 2: The BOP and the Foreign Exchange Market

2.1 Introduction

The foreign exchange market is the market where domestic money can be exchanged for foreign, and hence it is where the prices of many currencies are set. The price of foreign money is known as the exchange rate, denoted below by the letter E. Unlike the New York Stock Exchange, the foreign exchange market is not located in any one location. Rather, it is best thought of as a worldwide network of commercial banks linked together by sophisticated communications technology. Without doubt, it is the world's largest market; current estimates place the volume of *daily* worldwide trade at $3,200,000,000,000.[1] It is also one of the most efficient. It is characterized by low barriers to entry, a homogeneous commodity (money), many buyers and sellers none of whom has significant market power, and almost perfect information. Thus, it possesses all of the characteristics of a perfectly competitive market. And, because of its overall size and international dimensions, it is totally unregulated by any national or international government.

Most of the trading takes place in a small set of currencies including the U.S. dollar (86.3), the euro (37.0), the Japanese yen (16.5), the British pound (15.0), the Swiss franc (6.8), the Australian dollar (6.7), the Canadian dollar (4.2), the Swedish krona (2.8), the Hong Kong dollar (2.8), and the Norwegian krone (2.2).[2] Of these, the U.S. dollar is most often involved in trades. This is because it serves as a vehicle currency in the market. Exchange rates, the prices of currencies, are quoted in dollars around the world, and trades of two non-dollar currencies are often handled via an intermediate purchase of dollars with one currency and then a sale of those dollars

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[1] This is based on a 2007 BIS survey. See http://www.bis.org/publ/rpfxf07t.htm for details.

[2] Numbers in parentheses represent the percentage shares of average daily turnover in April 2007. The numbers sum to more than 100 because two currencies are always involved in each transaction.

for the other.

The foreign exchange market is almost always open. Business hours overlap around the world. The major foreign exchange trading centers are in London, New York, and Tokyo, with London accounting for about a third of all activity.. The market is busiest in the early morning London time when European and Asian banks are open, and early morning New York time when New York and London banks are simultaneously open. Other significant centers of trading activity include Zurich, Singapore, and Hong Kong.

Major participants in the foreign exchange markets include commercial banks, investment banks, and other financial institutions. These institutions conduct transactions in a variety of financial instruments. Major dealer banks have developed into an Interbank market, with more than 2000 registered dealer institutions world wide. Dealers trade with each other via the telephone or through electronic brokerage systems. Major dealers deal in all major currencies as well as a selection of developing country currencies. Some dealers act as market makers for certain currencies, quoting both bid and offer prices for these currencies and willing to use their own capital to insure that transactions occur at the prices that they quote. Some banks, especially in several European countries, act as currency brokers. That is, they bring together buyers and sellers of currency earning a commission in the process.

Non-dealer customers in the Interbank market include corporations, fund managers, individuals, and central banks (i.e. national monetary authorities). Corporations buy and sell currencies to process international trade activity and to fund payrolls for foreign operations. Fund managers buy and sell currencies in the process of buying or selling financial assets. Many central banks intervene in the foreign exchange market by buying or selling their own currencies in order

to influence currency values.

Over time the mix of activity with various clients in the market has changed. Dealer to dealer trading has shrunk 64% of all trades in 1998 to 43% in 2007.[3] Trade with other financial institutions (insurance companies, mutual funds, hedge funds, etc.) has risen from 20% to 40% over this same period. Trade with non-financial customers (corporations and individuals) has remained at roughly 17% of all activity over this same period.

2.2 Exchange Rates

The foreign exchange market is where most exchange rates are set. Listings of these rates from 2004 and 2008 are presented in Table 2.1. The numbers opposite the country names represent spot exchange rates. These are prices for currencies to be delivered within two working days. The first two columns report these prices in U.S. dollars. The next two columns report these same prices denominated in local currencies. There is simple mathematical relationship between these numbers. Column 3 (4) entries are reciprocals of column 1 (2). The rates that are quoted are the average between the bid price (the price dealers will sell that currency at that particular moment in time) and the offer (or asked) price (the price that they are willing to pay for that currency also at that moment). The difference between the two prices is known as the spread. For major currencies in Interbank trades, the spread is very small. For instance, on June 26, 2008 the spread on the dollar price of the euro was quoted at .000201¢.[4] The spread represents a source of profit to currency traders. Extremely active competition between dealer banks for this business insures that the widths of the spread on various currencies tend to be small. Widths increase the often currencies are traded.

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[3] This share is down from 85% in 1990.

[4] This spread is not shown in the table. It represents .0129% of the dollar price of 1 euro on that day.

Table 2.1
Exchange Rate Quotes

Foreign Exchange data for Thursday, April 8, 2004

The New York foreign exchange mid-range rates below apply to trading among banks in amounts of $1 million and more, as quoted at 4 p.m. Eastern time by Reuters and other sources. Retail transactions provide fewer units of foreign currency per dollar. Rates for the 11 Euro currency countries are derived from the latest dollar-euro rate using the exchange ratios set 1/1/99.

Country	USD equiv Thursday	USD equiv Wednesday	Curr. per USD Thursday	Curr. per USD Wednesday
Argentina (Peso)	0.3565	0.3565	2.805	2.805
Australia (Dollar)	0.7624	0.7654	1.3116	1.3065
Bahrain (Dinar)	2.6525	2.6524	0.377	0.377
Brazil (Real)	0.3466	0.3479	2.8852	2.8744
Canada (Dollar)	0.7535	0.7639	1.3271	1.3091
1 Month Forward	0.7529	0.7632	1.3282	1.3103
3 Months Forward	0.7517	0.7619	1.3303	1.3125
6 Months Forward	0.7502	0.7602	1.333	1.3154
Chile (Peso)	0.001665	0.001658	600.6006	603.1363
China (Renminbi)	0.1208	0.1208	8.2781	8.2781
Colombia (Peso)	0.0003764	0.0003765	2656.7481	2656.0425
Czech Rep. (Koruna)	0.03715	0.03718	26.9179	26.8962
Denmark (Krone)	0.1622	0.1635	6.1652	6.1162
Ecuador (US Dollar)-e	1	1	1	1
Egypt Pound	0.16207	0.16221	6.1702	6.1648
Hong Kong (Dollar)	0.1283	0.1283	7.7942	7.7942
Hungary (Forint)	0.004869	0.004902	205.381	203.9984
India (Rupee)	0.02295	0.023	43.573	43.4783
Indonesia (Rupiah)	0.0001165	0.0001165	8583.691	8583.691
Israel (Shekel)	0.2213	0.2211	4.5188	4.5228
Japan (Yen)	0.009409	0.009497	106.2812	105.2964
1 Month Forward	0.009418	0.009506	106.1797	105.1967
3 Months Forward	0.009436	0.009524	105.9771	104.9979
6 Months Forward	0.009466	0.009556	105.6412	104.6463
Jordan (Dinar)	1.4104	1.4104	0.709	0.709
Kuwait (Dinar)	3.3887	3.3918	0.2951	0.2948
Lebanon (Pound)	0.0006601	0.0006601	1514.922	1514.922
Malaysia (Ringitt)-b	0.2632	0.2632	3.7994	3.7994
Malta (Lira)	2.8457	2.8628	0.3514	0.3493
Mexico (Peso)	0.08929	0.089	11.1995	11.236
New Zealand (Dollar)	0.6587	0.66	1.5181	1.5152
Norway (Krone)	0.1443	0.1455	6.93	6.8729
Pakistan (Rupee)	0.01743	0.01743	57.3723	57.3723
Peru (New Sol)	0.2886	0.2886	3.465	3.465
Philippines (Peso)	0.01777	0.01778	56.2746	56.243
Poland (Zloty)	0.255	0.2567	3.9216	3.8956
Russia (Ruble)-a	0.03508	0.03506	28.5063	28.5225
Saudi Arabia (Riyal)	0.2667	0.2667	3.7495	3.7495
Singapore (Dollar)	0.596	0.5971	1.6779	1.6748

Slovak Rep. (Koruna)	0.03014	0.03037	33.1785	32.9272
South Africa (Rand)	0.159	0.1579	6.2893	6.3331
South Korea (Won)	0.0008745	0.0008772	1143.5106	1139.9909
Sweden (Krona)	0.1317	0.1326	7.593	7.5415
Switzerland (Franc)	0.7793	0.7833	1.2832	1.2767
1 Month Forward	0.7798	0.7839	1.2824	1.2757
3 Months Forward	0.7809	0.785	1.2806	1.2739
6 Months Forward	0.7824	0.7865	1.2781	1.2715
Taiwan (Dollar)	0.03049	0.03038	32.7976	32.9164
Thailand (Baht)	0.02556	0.0256	39.1236	39.0625
Turkish (Lira)	7.5E-07	7.5E-07	1333333.3333	1333333.3333
U.K. (Pound)	1.834	1.8405	0.5453	0.5433
1 Month Forward	1.8294	1.8357	0.5466	0.5448
3 Months Forward	1.8194	1.8257	0.5496	0.5477
6 Months Forward	1.8044	1.8103	0.5542	0.5524
United Arab (Dirham)	0.2723	0.2723	3.6724	3.6724
Uruguay (Peso) Financial	0.0337	0.0337	29.6736	29.6736
Venezuela (Bolivar)	0.000521	0.000521	1919.3858	1919.3858
Special Drawing Rights	1.474	1.4707	0.6784	0.6799
Euro	1.208	1.2175	0.8278	0.8214

Special Drawing Rights (SDR) are based on exchange rates for the U.S., euro, British, and Japanese currencies. Source: International Monetary Fund. a-Russian Central Bank rate. b-Government rate. d-Floating rate; trading band suspended on 4/11/00. e-Adopted U.S. dollar as of 9/11/00. f-Floating rate, eff. Feb 22.

Foreign Exchange data for Tuesday July 8, 2008

Based on trading among banks of $1 million and more, as quoted at 4:00 pm Eastern time to Reuters and other sources.

Country/currency	USD equiv Monday	USD equiv Friday	Curr. per USD Monday	Curr per USD Friday
Americas				
Argentina peso*	0.3312	0.3304	3.0193	3.0266
Brazil real	0.6248	0.622	1.6005	1.6077
Canada dollar	0.9819	0.9804	1.0184	1.02
1-mos forward	0.9815	0.98	1.0188	1.0204
3-mos forward	0.9808	0.9793	1.0196	1.0211
6-mos forward	0.9801	0.9786	1.0203	1.0219
Chile peso	0.001968	0.001956	508.13	511.25
Colombia peso	0.0005701	0.0005719	1754.08	1748.56
Ecuador US dollar	1	1	1	1
Mexico peso*	0.0968	0.0968	10.3316	10.3348
Peru new sol	0.3511	0.346	2.8482	2.8902
Uruguay peso†	0.0519	0.0517	19.27	19.34
Venezuela b. fuerte	0.46628742	0.46628742	2.1446	2.1446
Asia-Pacific				
Australian dollar	0.9555	0.9634	1.0466	1.038
China yuan	0.1456	0.1458	6.8674	6.859
Hong Kong dollar	0.1282	0.1282	7.8014	7.7994
India rupee	0.02315	0.02317	43.1965	43.1593
Indonesia rupiah	0.0001086	0.0001086	9208	9208
Japan yen	0.009333	0.009366	107.15	106.77
1-mos forward	0.009349	0.00938	106.96	106.59
3-mos forward	0.00938	0.00941	106.61	106.22
6-mos forward	0.009432	0.00947	106.02	105.63
Malaysia ringgit§	0.3062	0.306	3.2658	3.268
New Zealand dollar	0.754	0.759	1.3263	1.3175
Pakistan rupee	0.01391	0.01434	71.891	69.735
Philippines peso	0.022	0.022	45.558	45.413
Singapore dollar	0.7339	0.7342	1.3626	1.362
South Korea won	0.000962	0.0009534	1039.5	1048.88
Taiwan dollar	0.03291	0.0329	30.386	30.395
Thailand baht	0.02972	0.02984	33.647	33.512
Vietnam dong	0.00006	0.00006	16847	16848
Europe				
Czech Rep. koruna**	0.06702	0.06645	14.921	15.049
Denmark krone	0.2108	0.2105	4.7438	4.7506
Euro area euro	1.5719	1.5699	0.6362	0.637
Hungary forint	0.006786	0.006713	147.36	148.96
Norway krone	0.1967	0.1968	5.0839	5.0813
Poland zloty	0.4758	0.4738	2.1017	2.1106
Romania leu	0.4392	0.4349	2.2768	2.2992

Russia ruble‡	0.04259	0.04257	23.48	23.491
Slovak Rep koruna	0.05204	0.05184	19.216	19.29
Sweden krona	0.1671	0.1673	5.9844	5.9773
Switzerland franc	0.9747	0.9752	1.026	1.0254
1-mos forward	0.975	0.976	1.0256	1.0251
3-mos forward	0.9753	0.9759	1.0253	1.0247
6-mos forward	0.9763	0.9766	1.0243	1.024
Turkey lira**	0.8131	0.8105	1.2299	1.2338
UK pound	1.9769	1.9823	0.5058	0.5045
1-mos forward	1.9721	1.9777	0.5071	0.5056
3-mos forward	1.9635	1.9688	0.5093	0.5079
6-mos forward	1.9506	1.9559	0.5127	0.5113
Middle East/Africa				
Bahrain dinar	2.652	2.652	0.3771	0.3771
Eqypt pound*	0.1875	0.1875	5.3325	5.3325
Israel shekel	0.3078	0.3067	3.2489	3.2605
Jordan dinar	1.4135	1.4129	0.7075	0.7078
Kenya shilling	0.01531	0.01531	65.3	65.32
Kuwait dinar	3.7702	3.7695	0.2652	0.2653
Lebanon pound	0.0006634	0.0006634	1507.39	1507.39
Saudi Arabia riyal	0.2666	0.2666	3.7509	3.7509
South Africa rand	0.1292	0.1293	7.7399	7.734
UAE dirham	0.2722	0.2723	3.6738	3.6724
SDR††	1.6233	1.6364	0.616	0.6111

*Floating rate †Financial §Government rate and ‡Russian Central Bank rate
**Commercial rate †† Special Drawing Rights (SDR); from the International Monetary Fund; based on exchange rates for the dollar, euro, pound, and yen.

Comparing the values in the table between 2004 and 2008 provides some interesting details on the behavior of exchange rates. First, some rates have changed, and some of these changes have been quite large. The price of the Canadian dollar has risen from about 75¢ in 2004 to almost $1.00 in July 2008. The price of an Australian dollar has risen by roughly the same amount over this period. Many other currencies, including the Brazilian real, the Danish krone, Mexican peso, the New Zealand dollar, the Polish zloty, the Russian ruble, and the Swiss franc also rose in terms of the dollar over the past four years. Not all currencies saw their dollar prices rise. Both the Pakistani rupee and the South African rand lost value in dollar terms. The price of a number of other currencies hardly changed. These include the Hong Kong dollar, the Jordanian dinar, the Saudi Arabian riyal, and the Japanese yen.[5]

Second, you should note that even though some of the exchange rates have changed fairly substantially over the four year interval presented in the table, day to day changes in exchange rates tend to be relatively small. It is not impossible for large changes to occur from one day to the next, but it is very rare. And, for these days at least, large changes did not happen for any of the countries or currencies shown in the table.

Table 2.1 only presents data on exchange rates between the dollar and various currencies. Suppose that you had recently been in London and returned to America with some unspent pounds. Suppose now you must go to France and would like to exchange your pounds for euros. Is there anyway to calculate from the data in the table the exchange rate that you would pay to buy €'s with

[5] As this discussion indicates, there are many different exchange rates vis a vis the dollar (or any other currency) and at any given point in time, these rates will tend to move in various directions. Is there a way to measure what is happening to the dollar against all (or most) currencies at that point in time? The answer is to look at the *effective exchange rate*. The effective rate is a weighted average of all (or most) of the individual exchange rates for a country. The weights that are used in these measures are related to the size of trade between that country and the foreign counterpart.

£'s? The answer is yes; it involves calculating a cross rate. A cross rate can best be thought of as using the dollar as an intermediary currency. In this case, sell £'s for $ and the use the $ to buy €'s. Both the $ rates needed for such a transaction appear in the table. In the process you have converted pounds into euros, and the number of pounds needed to purchase one euro can be determined by multiplying the two dollar rates. Here is the formula for the example just discussed:

$$£/€ = £/\$ \times \$/€$$

The term on the left is the price of 1 euro in terms of pounds. It equals the price of 1 dollar in terms of pounds times the dollar price of 1 euro. From the table (using April 8, 2004 exchange rates), the formula becomes:

$$.6587 = .5453 \times 1.208$$

Using instead July 8, 2008 exchange rates the formula is:

$$.7951 = .5058 \times 1.5719$$

Thus, according to these calculations, the pound price of the euro has also risen by about 20 percent over the past four years. As this example illustrates, once you have a set of bilateral exchange rates, you can use the data to calculate any other possible exchange rate by calculating the cross rate.[6]

For some countries, additional exchange rates are reported below the spot rate. These rates are known as forward exchange rates. A forward exchange rate is an exchange rate that is set today for a transaction involving a purchase or sale of foreign exchange at some future point in time. Imagine the opportunity to agree today for the price of something, say a car, that you don't expect to buy for another 6 months or year. A forward rate provides a price guarantee for future trade

[6] To test your knowledge of the use of cross rates, use the data in the table to calculate what has happened to the Japanese yen price of the Chinese yuan over the past four years.

foreign exchange. How is the forward rate determined? For the currencies of major Western countries, the forward rate is determined by covered interest parity.

Let i equal the interest rate in the United States, i* equal the interest rate in Japan, E equal the spot exchange rate (dollars per yen), and F equal the forward rate (dollars per yen).[7] Note as well that the interest rates are for the same period of time as the time span for the forward rate. Finally, suppose that the U.S. and Japanese investments are equally risky and have identical liquidity. Consider an American investor who is trying to decide between two investment strategies, one would have her invest her money in the U.S. earning a rate of return over the period of i. The other would have her invest her money in Japan. What would be her rate of return in that market? Clearly, she will earn i* percent. However, in order to earn this, she must first convert her dollars to yen at rate E. At the end of the period she will have yen, but she doesn't know what they will be worth. This is clearly risky. She can avoid this by agreeing before the investment is made to sell her yen when the investment matures at rate F dollars. If F is bigger (smaller) than E, then she will earn (lose) F - E dollars from this transaction on every dollar she converts into yen. The percentage rate of return from taking advantage of this cover is (F - E)/E. Thus, her (covered) percentage rate of return from investing in Japan is i* + (F - E)/E. Given this, it is now easy for her (or anyone else for that matter) to compare the two rates of return. Consider the following.

If: $i > i^* + (F - E)/E$ she (and everyone else) should invest in the United States.

Why? Because the rate of return in the United States exceeds the risk free rate of return on yen.

If: $i < i^* + (F - E)/E$ she (and everyone else) should invest in Japan.

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[7] Here and in the formulas that follow, interest rates are measured in decimal units. So, for example, if the interest rate in the United States is 5% then i = .05.

Why? Because the rate of return, after taking into account currency conversions, is higher in Japan than in the United States. If markets are free to change prices, then situations like this could not prevail for very long. People around the world would shift funds into Japan, driving down i* and F and raising E. The result would be to lower the right hand side of the equation and bringing about equality. That is, worldwide competition for funds will guarantee that the above equation holds with (essentially) perfect equality. That is, we would expect:

$$i = i^* + (F - E)/E$$

This last equation is know as the covered interest parity condition. Note that it can be rewritten as

$$i = i^* + F/E - 1$$

or

$$F = E \times (i - i^* + 1).$$

This last equation provides a formula for setting the value of the forward rate, given the spot rate and the two interest rates. This is essentially the pricing formula used by commercial banks when they set forward rates in the market. Note that F will be bigger (smaller) than E when U.S. interest rates are bigger (smaller) than foreign interest rates. If the two interest rates are equal, then F will equal E.[8]

In our discussion of both cross rates and forward rates, we have said that they are determined by specific formula. How do we know? The answer is that if they were not determined in this fashion, market forces would enter that would push the rates to the levels described by the formulas.

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[8] Since there are many different interest rates, which ones do banks use to set forward rates? They use Eurocurrency rates. These rates refer to short term deposit rates set by banks (usually) overseas on foreign currency deposits. Offshore dollar deposits are known as Eurodollars, so i would be the prevailing rate for a given deposit period on Eurodollar deposits, and so on.

These forces are known as *arbitrage*. Arbitrage is the search for and exploitation of riskless profit opportunities, and because the foreign exchange market is so efficient, arbitrage will begin should such opportunities arise. Consider the following example.

Suppose that at noon, the following exchange rate quotes are announced in New York: £1 = $2.00 and €1 = $1.00. Suppose further that at that very same moment in London, British banks announce an exchange rate of €1 = £ .6. What would you do if you were a currency trader? The price of euros in terms of pounds in New York is .5. So, you would buy euros in New York, where they are cheap, and sell them in London, making a profit of £ .1 per every €. How long would this take? Since most (major) market activity is now done electronically, it would take no time at all. How much risk is involved? Again the answer is that since trades can be accomplished in seconds, there would be no risk. If you began the transactions with (say) dollars, you could buy and sell and end up with dollars in seconds, and you would have many more than you started with. Given an opportunity such as this, it is clear why such price discrepancies between markets would not be likely to prevail. How would they disappear? The answer is demand and supply. In New York, the demand for euros (and their price) would rise, and in London the supply of euros would rise and their price would fall. This would go on until prices equalize. This example illustrates why we can be sure how cross rates are determined.

Forward rates have been quoted by commercial banks for more than a century. They are useful to businesses involved in international commerce because they represent a way of avoiding risk.[9] Consider a business in the United States that imports goods from Switzerland. It is quoted a price for these goods denominated in Swiss Francs (SF) , which it must pay when the goods arrive

[9] Using the forward foreign exchange to avoid currency risk is known as hedging.

in three months time. The business knows the current cost of these goods in terms of dollars, but the SF/$ exchange rate might (and certainly will) change during the three month period between the time the order is placed and when the goods are delivered. If the spot price of SF (in terms of $) rises, then the business will incur an unanticipated increase in its costs. To protect itself, it can negotiate a forward contract today at the prevailing 90 day forward rate, to establish the price it will pay for the SF it wants to buy in three months time. This convenience is itself virtually costless; the conventions of the market require only minimal prepayments of funds to obtain the contract, although the size of the ultimate transaction must usually exceed $1 million.

On the other hand, another firm might be anticipating the future receipt of SF from a Swiss customer. It knows the current dollar value of its sales, but not the spot value of the SF at the time they will be received. A forward contract to sell SF on the date they are received allows the firm to lock its dollar receipts.

We have already defined two types of trades made on the foreign exchange market, spot trades and forward trades. Table 2.2 provides information on the how much activity there is in the market on a daily basis by types of transactions. As the numbers indicate, in 2004 about one third of daily activity is in spot transactions and about one ninth in outright forwards. Most of the transactions, however, are of a third type known as foreign exchange swaps. A swap transaction is the sale of a foreign currency with a simultaneous agreement to repurchase it at some date in the future or the purchase of a foreign currency with an agreement to resell it at some date in the future. Thus, swap transactions combine activity in both the spot and forward markets.

In the U.S. foreign exchange market and several of the major European financial centers, there are additional ways to lock in future prices. Futures markets work in much the same way as

Table 2.2
Foreign Exchange Market Activity by Transaction Type

Global foreign exchange market turnover[1]

Daily averages in April, in billions of US dollars

	1989	1992	1995	1998	2001	2004
Spot transactions	317	394	494	568	387	621
Outright forwards	27	58	97	128	131	208
Foreign exchange swaps	190	324	546	734	656	944
Estimated gaps in reporting	56	44	53	60	26	107
Total "traditional" turnover	590	820	1,190	1,490	1,200	1,880
Memo: Turnover at April 2004 exchange rates[2]	650	840	1,120	1,590	1,380	1,880

[1] Adjusted for local and cross-border double-counting. [2] Non-US dollar legs of foreign currency transactions were converted from current US dollar amounts into original currency amounts at average exchange rates for April of each survey year and then reconverted into US dollar amounts at average April 2004 exchange rates. Table B.1

forward markets. These markets provide the opportunity to buy or sell relatively small bundles of currencies for delivery at future points in time at prices set today. These markets allow relatively small firms to hedge foreign exchange risk.

Another type of contract that has recently been established is a foreign exchange option. This contract gives the holder the right to buy (a call option) or sell (a put option) a specific amount of foreign exchange at a specific price. That is, the purchase of an option is not a commitment to buy or sell foreign exchange. Rather, it guarantees the opportunity to do so at a specific price should the holder decide that it is in its best interests to make the transaction. Options do not have to be exercised. The advantage of options is that they provide insurance against bad movements in the exchange rates. Recall our example of the U.S. importer above. If it buys a call option for SF which guarantees a price of SF at the time of delivery of, say, $.60, and if the spot rate at the time of

delivery were to be only $.58, the importer would not exercise the option. If instead the spot rate were to be $.61, the importer should exercise the option.

2.3 The Foreign Exchange Market and the BOP

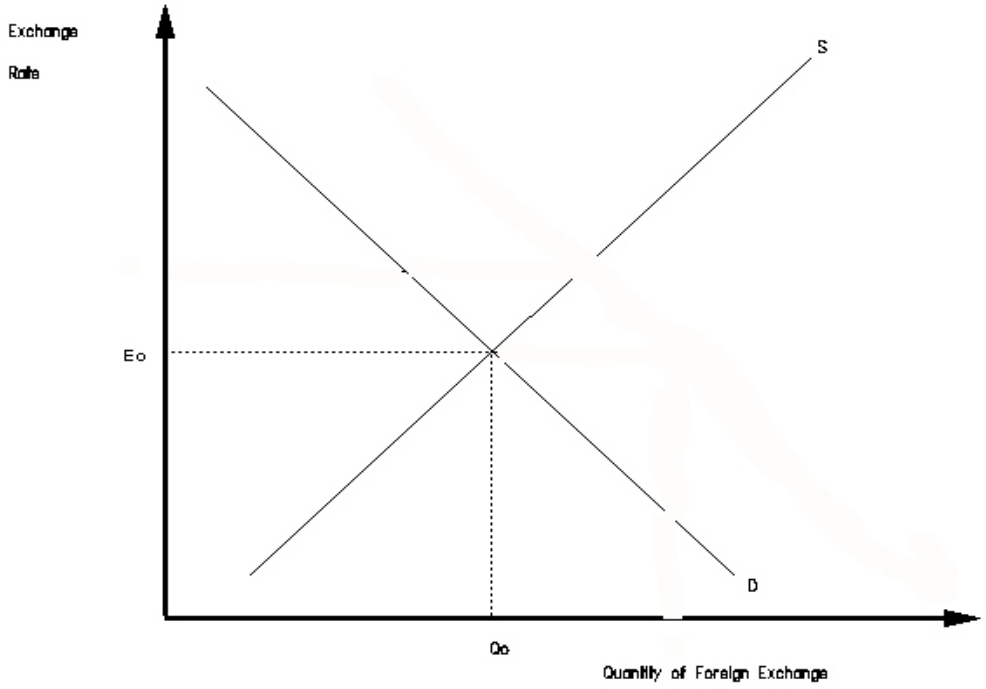
Our analysis in Chapter 1 of the entries in the BOP table suggests a link between the numbers in the BOP table, the foreign exchange market, and a country's exchange rate. In particular, the credit items in a country's BOP represent sales of things to foreigners and a consequent inflow of foreign money. Equivalently, one might think of these credits as elements of the supply of foreign exchange to the foreign exchange market. We illustrate this by the upward sloping supply curve in Figure 2.1.

Why does the supply curve of foreign exchange slope up? As E gets larger and larger, this means that the price foreigners pay for local currency is falling. In turn, since our goods, services, and financial assets are priced in terms of our currency, these items become cheaper for foreigners to buy as E rises. To understand this point better, consider the following example. Suppose that initially the U.S. dollar price of British pounds (£) is $1.60 and that the price of a Dell personal computer is $1000. To calculate the price of this computer in terms of £ simply divide the U.S. price by the exchange rate:

£ price of IBM computer = $1000/E = $1000/1.60 = £625.

Now, suppose that E rises to $2.00. This will change the £ price of computers, even though the dollar price remains constant. The new price will be £500 (i.e. $1000/2.00). Clearly, an increase in the exchange rate (the price of £'s) should enable Dell to sell more computers in Britain, because the cost to British consumers of these goods has fallen. This would hold true for all other U.S. goods, services, and financial assets and we would expect sales of all of these types of goods to rise and,

Figure 2.1



under reasonable conditions, the total revenue from these sales to also rise.[10] Recall that these revenues are the credits in the U.S. balance of payments and represent the total inflows of foreign money.

Debits in our BOP represent purchases of foreign goods and a consequent outflow of domestic money. That is, debits are elements of the demand for foreign exchange. We show this demand in Figure 2.1 as a downward sloping curve. Why does the demand curve slope down? Clearly, as E rises, foreign goods cost more. Consider the following example. Suppose that Scotch whiskey costs £1000 per case. If E equals $1.60, the U.S. dollar price of this whiskey can be calculated as follows:

[10] In Chapter 4 of this text we will examine this process in more detail.

$ price of whiskey = E * £ price of whiskey = $1.60 * 1000 = $1600

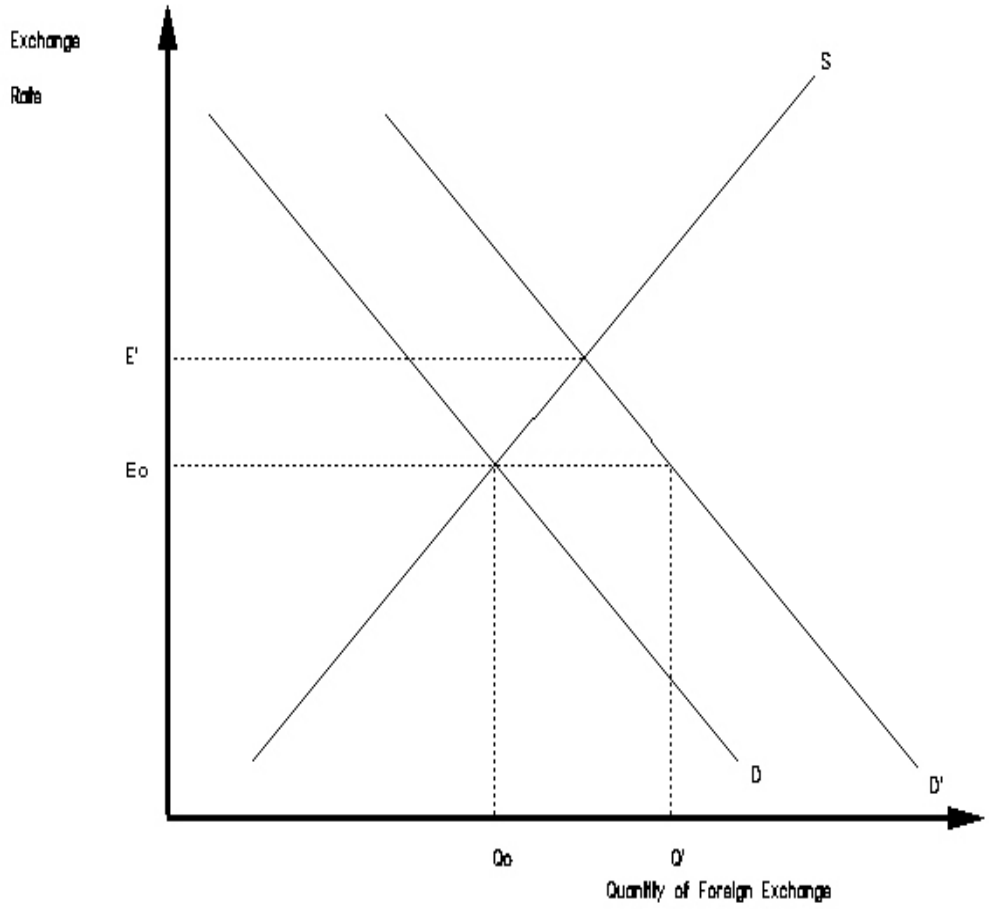
If E were to rise to $2.00, then the $ price of whiskey would rise to $2000 (i.e. $2.00*£1000). Thus, since the price of foreign goods, services, and financial assets become more expensive in local currency (here $), we expect that the demand for these items will fall as E rises, and the demand for foreign exchange is downward sloping.

Under a system of *flexible exchange rates*, the exchange rate--which is the price of foreign money--adjusts to bring about equilibrium between demand and supply. A simple example of how this adjustment occurs is illustrated in Figure 2.2. Suppose that the market is initially in equilibrium with the exchange rate equal to E_0. Suppose that there is a sudden increase in demand for foreign currency. The demand curve shifts out to D', and the exchange rate responds by rising to E'. This rise in the price of foreign money is known as an *appreciation* of foreign currency, and, since domestic residents must now pay a higher price in terms of their currency for one unit of foreign, a *depreciation* of domestic currency.

Some countries have policies of *fixed exchange rates*. Such rates are set by the government and need not yield equilibrium between demand and supply. If not, that country will have a BOP imbalance (disequilibrium) which must be financed by a gain (if the BOP is in surplus) or loss (if in deficit) of international reserves.[11] An example of how fixed exchange rates work is shown in Figure 2.2. There, it is assumed that the government has set the exchange rate at a value of E_0. So long as demand and supply intersect at that price, the government need do nothing. However, if the demand for foreign money were to increase--perhaps due to higher interest rates paid by foreign governments on foreign assets leading to an increased desire by domestic residents to purchase those

[11] The BOP is defined here as the overall balance.

Figure 3.2



assets, there would be upward pressure on the value of E. As drawn in the diagram, under flexible exchange rates, E would rise to E'. But, under fixed exchange rates, this adjustment in price cannot take place. Rather, since the government has established a policy of maintaining a constant exchange rate, there will be a excess demand for foreign money at the original rate, E_0.

To keep the price fixed, the government must supply additional amounts of foreign money to the market. It does so by selling off some of its foreign reserves. That is, its holdings of foreign reserves fall which implies a deficit in the country's overall balance. In terms of the figure, the deficit

would equal Q'- Q_0 units of foreign exchange. The country suffers an overall balance of payments deficit because the exchange rate it has set (E_0) is too low compared to the price the market would like to set (E').

If instead (not shown in the diagram) the economy had begun at the original equilibrium point and then demand for foreign exchange fell, under flexible rates the exchange rate would fall below E_0. This is known as a depreciation of foreign exchange and an appreciation of home currency. Under fixed rates, the country would find that the price it has set for foreign currency is now too high relative to what the market would set, the country's central bank would have to buy up the excess supply in order to maintain the rate at E_0. This is situation currently faced by the PRC that was described in Chapter 1.

Exercises #2.1

1. Suppose that one euro costs 80¢ on January 1. Suppose that on March 1, one euro costs 75¢. What has happened to the value of the dollar (in terms of euros) over this period?

2. Suppose that you are a purchasing agent for a domestic firm and you are thinking about buying goods from a European firm. Suppose the total value of those goods is € 500,000. How much would you have spent if you'd purchased the goods in January? How much if you'd waited until March? Suppose you knew in January that you wanted to buy the goods, but that you wouldn't actually make the expenditure until March. What action(s) could you take in January?

3. Using Table 2.1, calculate the price of 1 Australian dollar in terms of Japanese yen on Thursday April 8. Repeat this exercise using July 8, 2008 exchange rates.

4. According to Table 2.1, were 1 month interest rates higher in the United States or Canada on Thursday April 8, 2004? On July 8, 2008? How do you know?

5. Suppose that the spot price of a euro is $1.00, the 1 year forward rate on euros is $1.05, and the interest rate on 1 year euroland deposits is 10%. What would the interest rate have to be in the United States to make you indifferent between putting your money there or here?

6. Draw a figure such as Figure 2.1 to illustrate equilibrium for a particular currency in the

foreign exchange market. Now, show what would happen to the exchange rate (under flexible rates) and the country's overall balance of payments if the demand for foreign currency were to fall. What type of real world event could cause such a fall?

7. Repeat exercise 6 under the assumption that instead of a fall in demand for foreign exchange there is an increase in supply. What could cause such an increase?

8. Consider the information presented below (all values are in US$):

Australia	.50
30 day forward	.49
Switzerland	.25
30 day forward	.26

a. Let E denote the spot exchange rate and F denote the 1 month forward rate. Derive the formula that shows how F is determined in the foreign exchange market and how its value is related to E. Under what conditions in the real world is this formula most likely to hold true?
b. Based on the information provided above, where (among the United States, Australia or Switzerland) are one month interest rates the highest? Lowest?
c. Given the information, what is the Australian dollar price of 1 Swiss franc?
d. What is the Swiss franc price of 1 Australian dollar?

FAQ

to be added!