Chapter 11

International Economics II: International Finance

The other major branch of international economics is international monetary economics, also known as international finance. Issues in international finance have importance for international trade as well as for the effectiveness and transmission mechanisms of both monetary policy and fiscal policy. Exchange rates between currencies play a central role in the field of international finance, so we will begin with a definition of exchange rates and then turn to a study of how exchange rates are determined, followed by a discussion of the two major types of exchange rate systems that exist between countries.

Very simply stated, the **nominal exchange rate** between two countries is the price of one country's currency in terms of the other country's currency. Because the nominal exchange rate is ultimately just a price, the main analytical tools to use in thinking about exchange rates are, as we will soon see, the familiar concepts of supply and demand. Some examples illustrating the terminology are:

1. The exchange rate between the U.S. and Canada on January 4, 2002 was 1.59 Canadian dollars per one U.S. dollar. Another (completely equivalent!) way of stating this is that the exchange rate was 0.63 (=1/1.59) U.S. dollars per one Canadian dollar.

2. The exchange rate between the U.S. and Mexico on January 4, 2002 was 9.17 pesos per one U.S. dollar — or, equivalently, 0.109 (=1/9.17) U.S. dollars per one Mexican peso.

3. Immediately following the January 2002 devaluation of the Argentine peso, the exchange rate between the U.S. and Argentina was 1.4 pesos per one U.S. dollar — or, equivalently, 0.71 (=1/1.4) U.S. dollars per one Argentine peso.[1]

Important to note is the two equivalent ways of expressing the exchange rate between two countries that is demonstrated in the above examples. Note that in each example, one way of expressing the exchange rate is simply the inverse of the other way of expressing it.

[1]By early April 2002, the exchange rate had moved further, to approximately 2.9 Argentine pesos per one U.S. dollar.

There are two major kinds of exchange rate regimes that exist in the world — floating regimes and fixed regimes.[2]

11.1 Floating Exchange Rates

If market forces are allowed to determine the exchange rate between two countries, the exchange rate is said to be "floating." As usual, "market forces" simply means the forces of supply and demand. You are already very familiar with what "demand for a good" and "supply of a good" means. We are careful here to *exclude* any demand for or supply of a currency that a central bank's actions may generate. The reason for this is that central banks' demand for money plays a very special role in exchange rate determination, to which we turn at length below. With this important exception in mind, we should describe the factors that generate "demand for a currency" and "supply of a currency." For the following discussion, assume there are two countries, country 1 and country 2, and the domestic currencies in these countries are currency 1 and currency 2, respectively.

11.1.1 Demand for a Currency

There are three reasons why the citizens of one country (country 1) would demand currency of another country (country 2). They are:

- Demand for goods and services produced in country 2
- Demand for physical assets (i.e., factories) located in country 2
- Demand for financial assets (i.e., stocks and bonds) of country 2

Not surprisingly, sellers (of goods, services, and assets) in country 2 likely desire payment in their home currency, currency 2, no matter who is buying from them. Thus, when citizens of country 1 wish to purchase any goods, services, or assets from country 2, they will have to first buy currency 2 using their own currency, currency 1.[3] Thus, the above three channels all lead to demand for currency 2 by citizens of country 1. Because demand for a currency arises due to demand for other items, it is said to be a **derived demand.**

11.1.2 Supply of a Currency

Through the same channels as in the preceding discussion, citizens of country 2 will have a demand for currency 1. Thus, the citizens of country 2 will give up currency 2 in order to obtain currency 1. This surrender of currency 2 by citizens of country 2 leads to the supply of currency 2. That is, citizens of country 2 supply currency 2 to the exchange market because

[2]The trend in recent history has been a move away from fixed exchange rates and toward floating rates.

[3]You may be thinking at this point that when you buy, say, a pair of shoes made in Italy at your local shop, you don't have any demand for lira (or, beginning January 1, 2002, euros). That is because some other agent has already made the necessary dollar for euro exchange for you – knowing that you (or somebody else) would eventually purchase. But it is perhaps easier and more instructive for you to think of the demander of euros in this case to be *you*, the consumer.

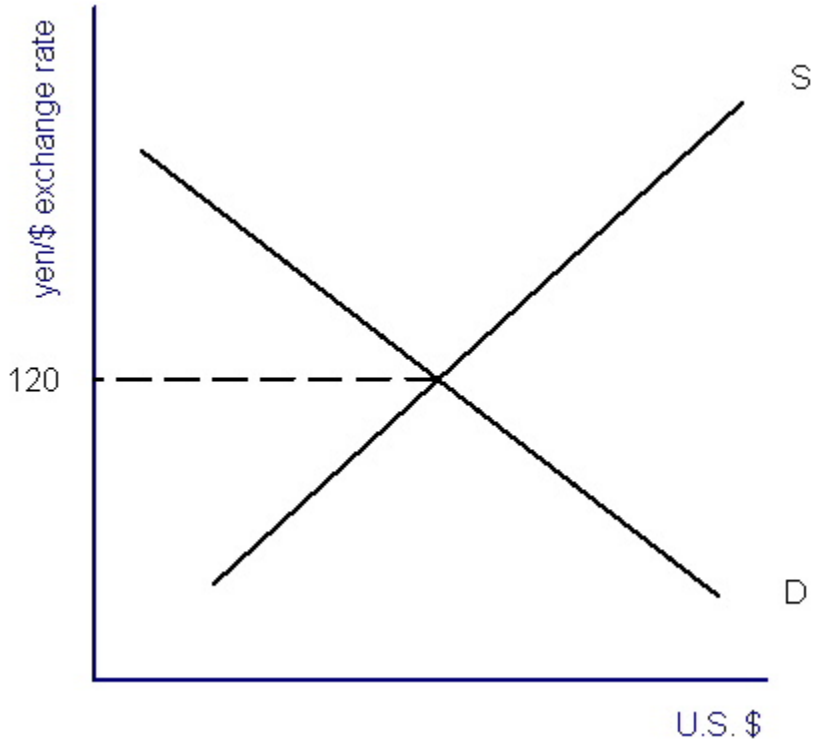

Figure 11.1: **Determination of Equilibrium Exchange Rate.**

of their demand for the goods and assets of country 1. The demand for one currency, then, is intimately related to the supply of another currency. Indeed, we can think of the demand for a currency as essentially the same as the supply of another currency.

11.1.3 Equilibrium

The price of currency 2 in terms of currency 1, then, is determined as that price at which the demand for currency 2 equals the supply of currency 2.[4] Figure 11.1 provides an illustration in which the yen/U.S. dollar floating exchange rate is 120 yen/dollar.

11.2 Currency Appreciation and Depreciation

Changes in floating exchange rates occur due to changes in demand and supply. In currency markets, such price changes have a particular terminology associated with them. A currency is said to **appreciate** relative to another currency when it becomes more expensive in terms of another currency. In terms of the example in Figure 11.1, if the price of one U.S. dollar in terms of yen rises, say to 130 yen/dollar, the yen has depreciated relative to the dollar. Other colloquial terminology for such a movement is that "the yen has weakened versus the

[4]So, clearly, the exchange market is just like any other market — price and quantity (in this case, exchange rate and amount of currency 2 bought and sold) are determined simultaneously.

Country	Currency	Price in U.S. $, July 1980	Price in U.S. $, June 1999
Australia	dollar	1.16	0.66
Canada	dollar	0.87	0.68
France	franc	0.25	0.16
Germany	mark	0.57	0.53
Italy	lira	0.0012	0.00053
Japan	yen	0.0045	0.0083
Mexico	new peso	44.0	0.10
Sweden	krona	0.24	0.12
Switzerland	franc	0.62	0.65
United Kingdom	pound	2.37	1.60

Table 11.1: Selected Exchange Rates

dollar" or "the yen has lost ground to the dollar." All of these phrases capture the fact that more yen are required to buy one dollar.

A currency is said to **depreciate** when it becomes less expensive in terms of another currency. In terms of Figure 11.1, for the same example just described, one U.S. dollar now purchases 130 yen instead of 120 yen. So the dollar has appreciated versus the yen, or "the dollar has strengthened versus the yen," or "the dollar has gained on the yen." This example illustrates an important concept: when considering any pair of currencies, if one currency appreciates versus the other, then *by definition* the second currency depreciates versus the first. As another example of the usage of the terminology, consider the data in Table 11.1, which presents the U.S. dollar price of several major currencies at three different points in time. Consider the Canadian dollar — between July 1980 and June 1999, the Canadian dollar depreciated versus the U.S. dollar. This then necessarily means that the U.S. dollar appreciated versus the Canadian dollar between July 1980 and June 1999.[5]

11.3 Factors Affecting Floating Exchange Rates

Aside from the fundamental supply of and demand for currencies, the factors that are believed to affect exchange rates in general differ according to whether we are considering the long-run, the medium-run, or the short-run.

11.3.1 Purchasing Power Parity (PPP) in the Long-Run

In the long run, economists believe that the price in any country of a particular good should be the same, *once the prices have been put into the same currency units using the nominal exchange rate.* This idea is known as purchasing power parity (PPP) and is very often used as a building block of research models of international finance.[6]

[5]Make sure you understand which currency is appreciating and which currency is depreciating. This point often confuses people.

[6]There is actually a technical difference between PPP and something called the Law of One Price (LOOP), which is the proper term for the description just given of PPP. But for our purposes they are the same concept.

As an example of PPP, say the price level in country 1 is 500 (measured in currency 1) and the price level in country 2 is 1,000 (measured in currency 2). PPP then says that in the long run, the exchange rate between the two currencies is 2 units of currency 2 for 1 unit of currency 1, which means that the price levels in the two countries are identical when measured in common units (i.e., the same currency).

11.3.2 The Medium Run

In the medium-run, a country with a relatively high growth rate often experiences a depreciation of its currency. The mechanism by which this happens is that because of the high growth rate, consumption is growing very fast — which would (usually) be accompanied by fast growth of imports as well. The surge in demand for imports would then increase the demand for foreign currency, thus resulting in a depreciation of the domestic currency.[7]

11.3.3 The Short-Run

In the short run, exchange rate movements are primarily determined by interest rate differentials among countries. Financial investors the world over who are seeking the highest possible returns will try, as much as possible, to acquire the financial assets of countries in which the interest rate is highest.

The mechanism by which this works is illustrated by the following example: say the interest rate in the U.S. is high relative to the interest rates in other countries. Then foreigners will want to hold U.S. financial assets because they offer better returns than the financial assets of other countries. This then means that the demand for U.S. dollars will increase — which causes the dollar to appreciate versus foreign currencies

11.4 Fixed Exchange Rates

Some individuals and governments believe that floating exchange rates (that is, exchange rates determined by market forces) may have an excessively high degree of volatility — that is, the degree of uncertainty in floating exchange rates is undesirable for the macroeconomy. Under this line of thinking, this uncertainty[8] may then lead to less international trade than would exist if there were less uncertainty regarding exchange rates. The preceding reasoning sometimes motivates a government to *fix* its exchange rate vis-à-vis some other currency. That is, the government does not allow the exchange rate to be market-determined. Rather, it may peg the exchange rate at some level it believes is desirable.

To cast fixed exchange rates in language familiar from introductory microeconomics, a government (notice we have not said *which* government yet — at this point, it does not matter) is essentially establishing a price floor or a price ceiling when it decides to fix an exchange rate. The price floor or ceiling is implemented in this case of foreign exchange markets by a central bank buying or selling an appropriate amount of one currency for

[7] And, of course, an *appreciation* of the foreign currency versus the domestic currency

[8] As well as the transactions costs associated with exchanging one currency for another, the elimination of which was the primary motivation for the creation of the euro.

another. The means of payment (payment received) for a government engaging in such an operation comes out of (goes into) its official foreign reserves.

Every government holds the currencies or bonds of (some or many) other countries as foreign reserves. These foreign reserves are used by governments for international financial operations, such as making interest payments to other countries and intervening in the foreign exchange market. U.S. bonds are the most widely-held foreign reserve asset. A few definitions are in order before proceeding to a more detailed consideration of how fixed exchange rate systems are managed.

Balance of Payments (BOP) — a set of accounts that summarizes a country's transactions (real *and* financial) with the rest of the world; the main components of the balance of payments are the current account, the capital account, and the official settlements balance.

Current Account (CA) — measures the sum of net exports, net investment income, and other items.[9]

Capital Account (KA) — measures the difference between sales of assets to foreigners and purchases of assets from foreigners; in effect, it measures the net inflows of foreign monies — for the U.S., for example, it is the difference between "dollars that leave the country" and "dollars that enter the country" through international financial transactions.

Official Settlements Balance (OSB) — records the change in official reserve assets (usually in the form of foreign currency or foreign bonds) held by the monetary authority of a country; if official reserves increase during some period of time, the official settlements balance for that period of time is *positive*; if official foreign reserves decrease during some period of time, the official settlements balance for that period of time is *negative*.

For any country, the current account and capital account for any period of time sum to zero, a fact known as the **fundamental balance of payments identity.** That is,

$$CA_t = -KA_t \tag{11.1}$$

in every period t. You can think of the basic reason for this identity as arising from a country's need to finance a trade deficit (surplus) by borrowing (lending) abroad. Trade directly impacts the current account, and international financial transactions directly impact the capital account. Thus, if a single international transaction affects both the current and the capital accounts, it must be that it generates offsetting entries in the two accounts.[10]

The fundamental balance of payments identity involves the current account and the capital account. The official settlements balance is used to record changes in official reserve

[9]The main "other item" is an item called net unilateral transfers, which are gifts (of money or goods) from the U.S. to other nations. For example, when U.S. residents of Mexican origin send a total of $100 million to their relatives in Mexico, the current account receives an entry of negative $100 million.

[10]It is possible for an international financial transaction to impact only one of the accounts, in which case two offsetting entries are generated in the same account.

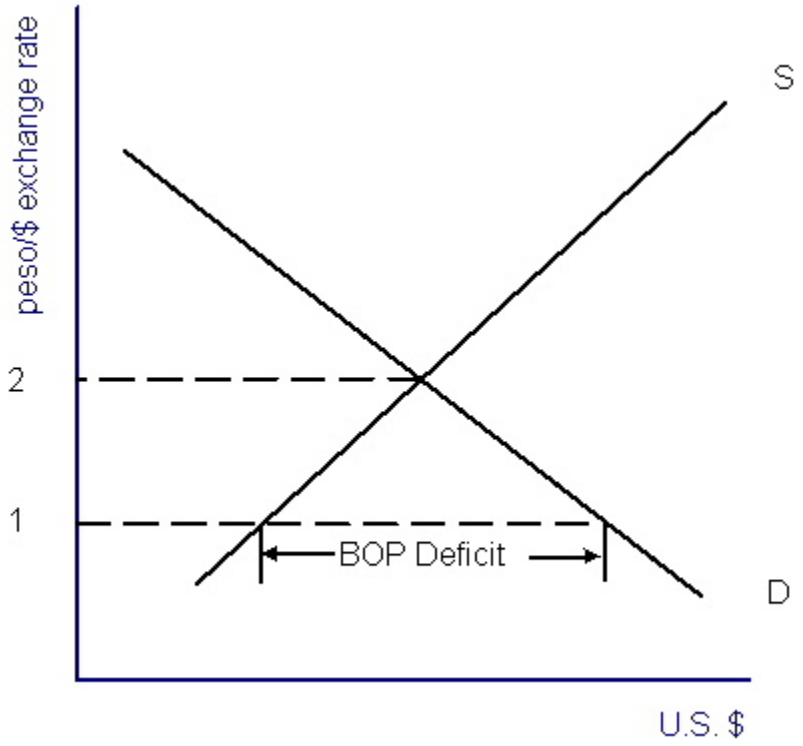

Figure 11.2: **A BOP deficit for Argentina.**

assets held by the monetary authority of a country. There are several types of transactions that are recorded in the official settlements balance, but the type of the most interest is interventions by the monetary authority in foreign exchange markets. If a government desires to maintain a fixed exchange rate of its currency vis-à-vis another currency, the mechanism by which it does so is buying or selling an appropriate amount of its currency using its official foreign reserves. The change in official foreign reserves resulting from such intervention thus generates a nonzero balance of payments. Algebraically, for any period t, the balance of payments for that period is determined as

$$BOP_t = CA_t + KA_t + OSB_t. \tag{11.2}$$

But by the fundamental BOP identity in (11.1) above, this last expression simply becomes $BOP_t = OSB_t$. Thus, in any time period t, the balance of payments is completely determined by how official foreign reserves changed during that time period.[11]

Another example will be useful in illustrating the concepts and terminology. From 1991 through January 2002, Argentina's central bank pegged the exchange rate between the Argentine peso and the U.S. dollar at one-to-one. However, the market exchange rate, if indeed free markets had been allowed to set the exchange rate, was for most of this period more than one peso per one dollar — let's say the free-market exchange rate would have been 3 pesos per dollar. This situation is illustrated in Figure 11.2. Notice in Figure 11.2 that

[11]Strictly speaking, this last statement is not true — there are other items which change the level of official foreign reserves. But for present purposes we will ignore these other items.

at the exchange rate of one peso per one dollar, there is excess demand for U.S. dollars. Thus, the only way for the desired peg to be maintained was for some institution to step into the foreign exchange market and supply the extra dollars so that the entire demand for U.S. dollars was met. This institution was the Argentine central bank — from 1991 until the demise of the peg in early 2002, it sold dollars in exchange for pesos. The source of the dollars it sold to the market was its official foreign reserves. Thus, because its official foreign reserves were declining due to the maintenance of the peg, the official settlements balance was negative during the currency peg, and as can be seen from expression (11.2), Argentina experienced balance of payments deficits (i.e., negative balance of payments) during this period.

Graphically, Figure 11.2 shows that the BOP deficit *in terms of dollars* for Argentina is the horizontal distance between the supply and demand curves for the U.S. dollar at the desired fixed exchange rate. To compute the BOP deficit in terms of pesos, this horizontal distance must be multiplied by the desired fixed exchange rate, because the units of the exchange rate depicted in Figure 11.2 achieve the necessary dollar to peso conversion. That is, supposing that the excess demand for dollars at the one-to-one exchange rate is X dollars, to find Argentina's BOP in terms of pesos we compute

$$X \text{ U.S. dollars } \cdot 1\frac{\text{peso}}{\text{U.S. dollar}} = X \text{ pesos.} \tag{11.3}$$

More generally, if the target fixed exchange rate were E pesos per dollar, and the excess demand for dollars at E were Y dollars, Argentina's BOP deficit in terms of pesos would be $(Y \cdot E)$ pesos.

11.4.1 Currency Runs

When a country is running a BOP deficit, it is draining its foreign reserves, which is the instrument by which the fixed exchange rate is maintained. If the BOP deficit persists, the country will eventually run out of foreign reserves. At that point, it will no longer be able to defend its fixed exchange rate, and the currency will become devalued — that is, it will return to its equilibrium value. If this were the end of the story, then the exchange rate would rise back to its equilibrium level, which is 2 pesos per dollar in Figure 11.2.

But in currency markets, this is rarely the whole story. Because BOP figures and foreign reserve levels for a country are public information, people (financial investors) will know that a country is running out of foreign reserves before they are actually completely drained. In order to protect their own financial assets, rational agents will want to dump their domestic currency holdings and increase their foreign currency holdings before the impending devaluation. Thus, there will be a large increase in the demand for foreign currency before the anticipated devaluation of the domestic currency. The result is that when the country actually does run out of reserves and has to let the currency return to its equilibrium value, the equilibrium value will be *higher* than what it would have been if the currency had been allowed to float freely in the first place.[12] That is, the eventual devaluation is more severe than if there were no currency run. Figure 11.3 shows that when the fixed exchange rate

[12]Indeed, foreign reserves will end up being drained more quickly due to the currency run. Such an event is called a balance-of-payments crisis.

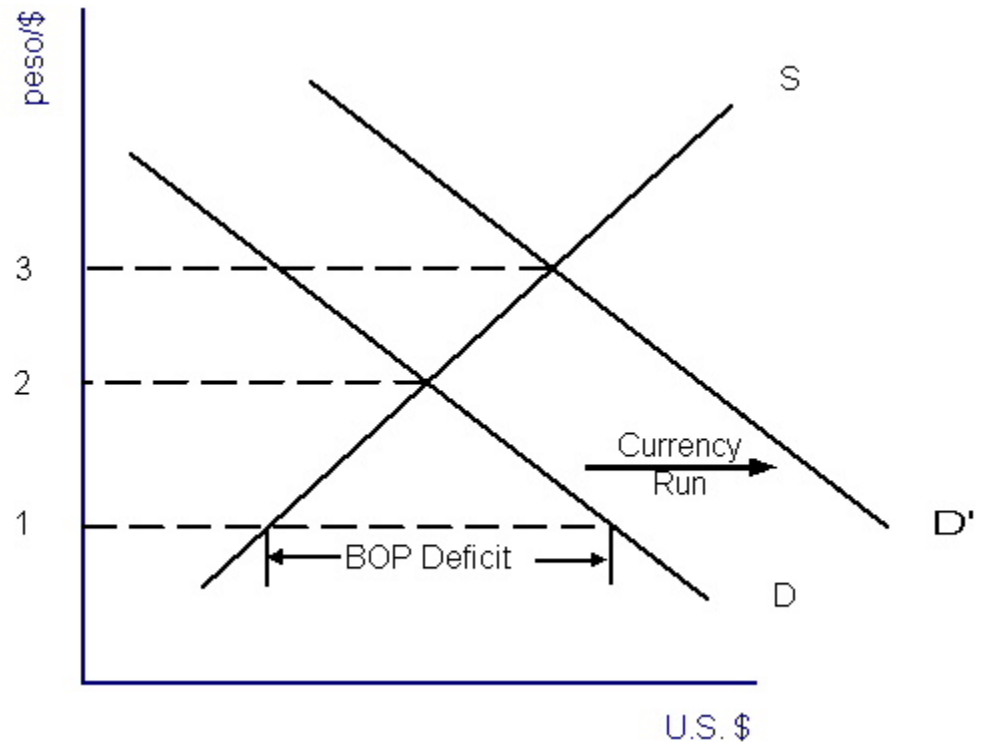

Figure 11.3: **A BOP deficit for Argentina.**

eventually has to be abandoned, the new exchange rate is determined by the intersection of S and D' rather than by the intersection of S and D.

11.4.2 BOP Surplus

Although the above discussion has focused on BOP deficits (that is, on fixed exchange rates in which the peg is below the equilibrium exchange rate), a BOP surplus is a perfectly well-defined concept as well. A BOP surplus arises when a fixed exchange rate is at a level that is above the equilibrium exchange rate and is illustrated in Figure 11.4, which illustrates a hypothetical case in which Japan is holding the yen/dollar exchange rate above its equilibrium value. To hold its currency weaker than the free-market value, Japan's central bank (the Bank of Japan) would have to *buy* dollars in exchange for yen at the target exchange rate. This is because at the target exchange rate, there is an excess *supply* of dollars which must be soaked up. In soaking up the extra dollars on the exchange market, the Bank of Japan would be accumulating foreign reserves, thus running a BOP surplus.[13]

[13]While the BOJ does not peg its currency, it did intervene temporarily in the exchange markets several times in the first half of 2002 to try to drive down the value of the yen versus the dollar. Its reason for doing so is that a weaker currency tends to stimulate exports. Despite its efforts, the yen has appreciated approximately ten percent during the first half of 2002.

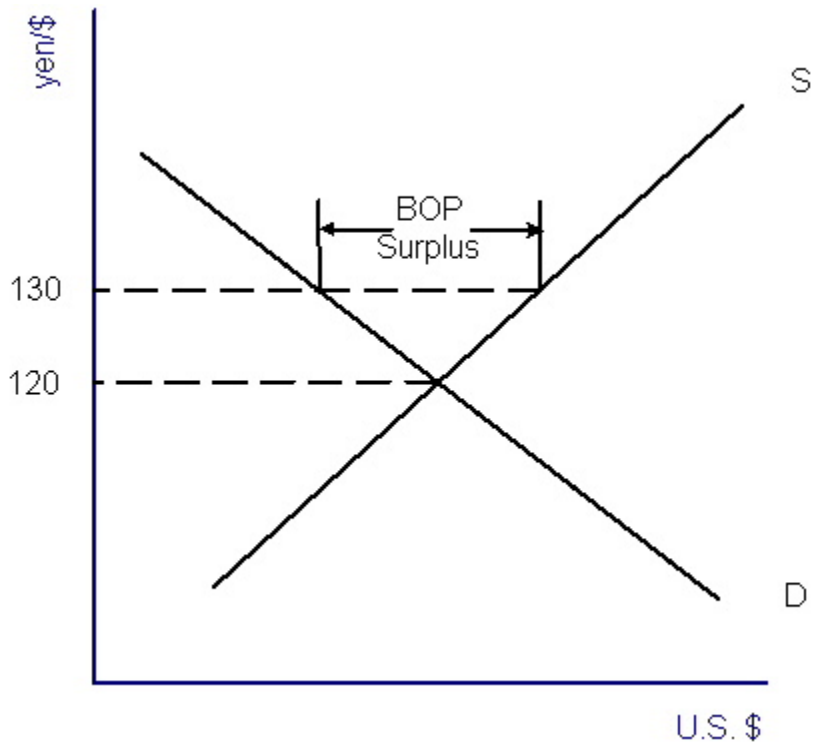

Figure 11.4: **A BOP surplus for Japan.**