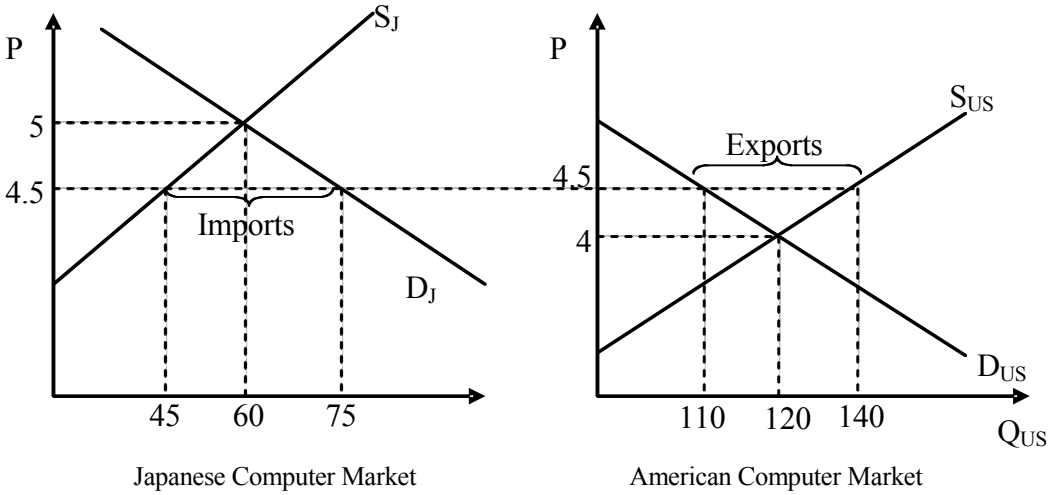
THE INTERNATIONAL MONETARY SYSTEM

PRELUDE

Remember this?



Yes, it is our familiar 2 × 2 international trade model, with two countries (US, Japan) and two goods (computers, stereos).

Remember the condition for an international free trade equilibrium was a single uniform price and the amount computer exports from US = amount of computer imports from Japan (in this case = 30). In this simple model, we assumed that the *only* other good was stereos. Because prices for computers are expressed in terms of stereos, because the only alternative to consuming/producing computers was to consume/produce stereos, because Japan was *paying* for computers *with* stereos & US *selling* its computers *for* stereos, then everything we said about the computer markets implicitly, when turned upside down, could also be said of stereos (just in the opposite direction).

In our simple example this is simple enough.

But the real world is a tad more complicated. People don't walk around with stereos to pay for stuff. They use national **currencies**. And that brings a new element into the middle of the trade story - exchange rates and currency markets. And the story stops being so neat.

TRADE BALANCE

Before we get started, introducing the notion of the *trade balance* is useful.

> **Trade Balance**: the value of net exports of a country, i.e. exports minus imports of a country's goods and services, expressed in a common unit of value.

In our 2 × 2 example this is straightforward. Suppose that at the free trade equilibrium (price = 4.5), Japan *imports* 30 computers and *exports* 135 stereos. What is the Japanese "trade balance"? Actually, zero. Because expressed in terms of stereos (our "common unit of value"), the 30 computers it imports are actually "worth" 135 stereos (price 4.5 × 30 computers = 135 stereos' worth of computers). So, Japanese trade balance = value of exports - value of imports = 135 - 135 = 0. The Japanese trade balance is *zero*. Notice the US trade balance is also zero.

But that is only in this very simplified example.

Let's mess it up a bit. Continue to assume that US and Japan are the only two countries in the world. Let's suppose the Japanese export 4000 worth of Japanese goods to the US, and import 3,600 worth of American goods. Then:

> Japanese Trade Balance = Japanese Exports - Japanese Imports
>
> = 4,000 - 3,600 = + 400

Japan has a positive trade balance, what is called a *trade surplus*. Since a Japanese export to the US is by definition a US import from Japan, and conversely a Japanese import from the US is by definition a US export to Japan, then:

> US Trade Balance = US Exports - US Imports
>
> = 3,600 - 4,000 = - 400

US has a negative trade balance, or what is called a *trade deficit*. In sum:

> **Trade Surplus**: a positive trade balance, the amount (in value terms) by which total exports *exceed* total imports in a country.
>
> **Trade Deficit**: a negative trade balance, the amount (in value terms) by which total imports *exceed* total exports in a country.

Notice that in our example, the Japanese trade surplus is exactly equal to the US trade deficit. This can be generalized. If a country has a trade surplus with the rest of the world, then the rest of the world *necessarily* have a trade deficit with that country.

EXCHANGE RATE

In our simple example above, it seems pretty nice & clean that US exports computers to Japan, and Japan exports stereos to the US, and all values are expressed in terms of stereos per computer, so it all adds up nice & neat.

But of course, in reality, people don't walk around paying for things in stereos. American consumers pay in dollars ($), and Japanese consumers pay in yen (¥). How does this change our story?

Well, suppose the following. Suppose you were running some sort of business or organization and decided to completely revamp your computers. Throw the old ones out, and buy a whole bunch of shiny new ones. You look up in a catalog or on the internet, and notice an American computer company that sells computers for $1,000 each. You also pick up a brochure from a Japanese computer company that sells computers for ¥140,000 each. Which one do you buy?

The cheapest one, of course. But which is cheapest?

You have no way to compare. One price is expressed in dollars, the other price is expressed in yen. You could try finding out the price of stereos in the US & stereos in Japan and convert it all to a common "stereos per computer" units. Or you could be a little more direct, and just look up the current **exchange rate**, that is how much a dollar is worth in terms of yen.

> **Exchange Rate**: the price of a currency in terms of another currency (e.g. yen per dollar).

Note: exchange rate is always expressed in terms of value of *one* unit: how many units of a certain currency it takes to buy *one* unit of the other currency. That is the exchange rate is the number of yen *per one dollar*.

So, suppose you find out that ¥150 =$1. That is exchange rate of the dollar *in terms of yen*.

You can also figure out reciprocally, that the exchange rate of the yen *in terms of dollars* is $(1/150) = ¥1. (calculating that out, ¥1 is worth around 2/3 of a US cent.)

When asked about the price or *value of the dollar*, the former is meant (so many yen per $1). When talking about the *value of the yen*, the former is meant (so many dollars per ¥1).

(This shouldn't be hard to remember. You always express the price of something in how much of something *else* to give up for *one* of that thing. e.g. price of coffee = $2 means you give up two Federal Reserve greenbacks for *one* cup of coffee. Price of computers = 4.5 stereos, means you give up 4.5 stereos for *one* computer.)

Now what? You have your exchange rate of ¥150 = $1. Well, if you have the value of something in dollars, then to calculate that value in terms of yen just multiply it by the exchange rate.

value in yen = (exchange rate of yen per $1) × (value in dollars).

So a $1,000 US computer is worth:

¥150 × $1,000 = ¥150,000

The US computer is worth ¥150,000. That is more expensive than the Japanese computer (which cost only ¥140,000). So you ought to buy the Japanese computer.

If you have a good expressed in yen, and want to figure out its value in dollars, just invert the formula:

$$\text{value in dollars} = \frac{(\text{value in yen})}{(\text{exchange rate of yen per \$1}}$$

So, a ¥140,000 Japanese computer is worth:

$$\text{value in dollars} = \frac{(¥140{,}000)}{¥150} = \$933$$

So now you can do the same in dollar terms, i.e. compare the cost of Japanese computer (= $933) to the American one ($1,000) and realize the Japanese computer is indeed cheaper.

What if the exchange rate was ¥120 =$1? This means that the value of the dollar is *lower* than before (i.e. $1 gets less yen than before). We say the dollar has *fallen* or *depreciated* relative to the yen.

Reciprocally, the value of the yen is $(1/120) = ¥1 (one yen is about five-sixths of a US cent). That means the value of the yen is *higher*. We say the yen has *risen* or *appreciated* relative to the dollar.

Notice that in *this* case, the ¥140,000 Japanese computer is now worth:

$$\text{value in dollars} = \frac{(¥140{,}000)}{¥120} = \$1{,}166.66$$

the Japanese computer costs $1,1166, which is quite more expensive than the American computer ($1000). So you buy American. Or, if you prefer thinking in terms of yen,

¥120 × $1,000 = ¥120,000

The US computer costs only ¥120,000, cheaper than the Japanese computer of ¥140,000

See how that works?

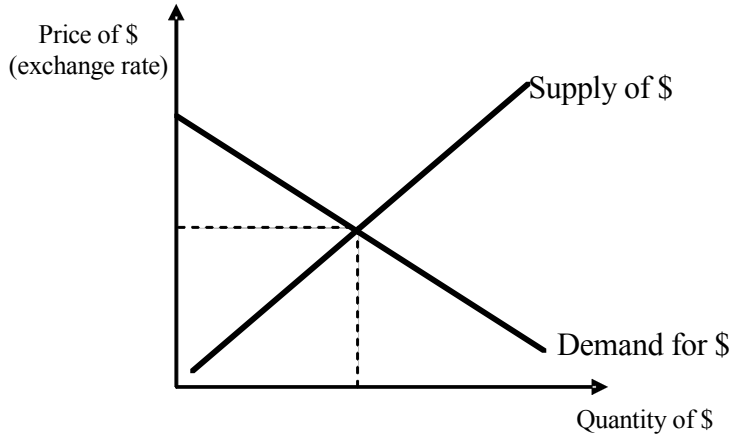
Finally, it should be pretty easy to check that if the exchange rate is ¥140 = $1, then the price of American computer is *identical* to the price of a Japanese computer.

So it seems as if your decision of whether to buy a US computer or a Japanese computer depends very much on the exchange rate of the yen per dollar.

FOREIGN CURRENCY MARKETS
- A First Approach -

It is clear that the amount exported and imported depends on the exchange rate. Which should prompt the question: well, what determines the exchange rate? But you already know the answer to that: Supply and Demand of course!

Well, supply & demand for *what* exactly? Well, demand and supply for dollars, I suppose. Let's draw it:



Market for Dollars

OK, good start. But it looks a bit strange.

To get started, let's simply ask what's the *price* of dollars we're drawing on our vertical axis? The price of anything is what we give up for it. In this case, we are giving up *yen* for the dollars. The price of the dollar is the **exchange rate** between yen and dollars.

[Note: we have two ways of expressing exchange rates: we can say $1 = ¥140 or reciprocally, ¥1 = $(1/140). Which do we plug in on the vertical axis? ¥140 (yen per dollar) or $(1/140) (dollars per yen)? This should be easy to resolve: remember, the price of something is always expressed in terms of a unit something else. If this was the coffee market, we'd put dollars per one coffee on the vertical axis. But since this is market *for dollars*, then the price axes should measure something for one dollar. That is, ¥140. That is the price of $1. (this can trip you up sometimes, so be careful).]

What about demand and supply? Who demands dollars? Who supplies dollars? This is where it gets tricky.

The temptation is to start saying something like "the US Federal Reserve supplies dollars, etc." Well, yes, in a grand sense. But it doesn't supply dollars *in exchange* for yen, so it is

not operating in this market. OK, how about demand for dollars? We need think this over carefully.

I call this the market for *dollars*, but it is really a foreign exchange market (currency market, forex market), that is the market where people *exchange* dollars *for* yen.

Foreign-Exchange Market: the market where currencies are bought and sold.

Where is the Forex market? As usual, it is abstract. But there are a few locations in this world where currency trading is concentrated. The major currency market is in London. Next, in order of importance, are New York, Tokyo, Singapore, Frankfurt, Geneva, Zurich, Paris and Hong Kong.

In currency markets, in order to demand dollars, you have to offer something in return. And what you offer in return is *yen*. So in order to demand dollars, you must supply yen. So to determine who demands dollars, we must figure out who *has* yen and *needs* dollars.

One type of person comes immediately to mind: US exporters to Japan.

When an American company exports computers to Japan, Japanese consumers pay for the computers with *yen*. That means the American company now has a lot of yen on hand. Of course, yen are no good to the firm. It has a computer factory back in the US, it must pay its American workers in dollars (American workers won't take their wages in yen).

So the American exporters must sell the piles of yen they receive from the sale of computers in Japan, and hope someone gives them dollars for it.

But is going to buy those piles of yen off them? Who is willing to sell their dollars in exchange for yen? Someone who *has* too many dollars and *needs* yen. Who might that be?

Japanese exporters to the US, of course.

Japanese firms who sell stereos to American consumers get paid in dollars. Again, they have no use for dollars (back in Japan, workers get paid in yen). So it must convert all these useless dollars into useful yen.

So we have a market. American exporters are supplying yen and demanding dollars, while at the same time Japanese exporters are demanding yen and supplying dollars.

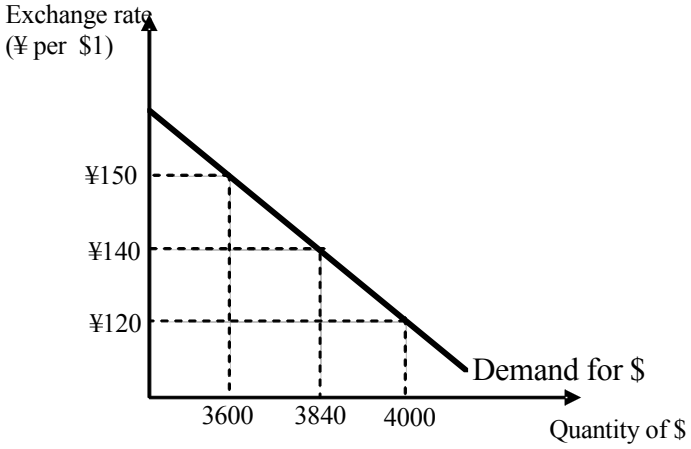
In short:

Demand for dollars = Supply of Yen = US Exports (= Japanese Imports)

Supply of dollars = Demand for Yen = Japanese Exports (= US Imports).

Slopes of Demand & Supply

OK, so far so good. But notice that demand & supply curves have slopes. Let us consider the demand for dollars first. It has a shape like the following:



When the exchange rate is ¥140, then quantity of dollars demanded demand is 3840. If exchange rises to ¥150, demand for dollars falls to 3600. Why?

Your first instinct might be to think that demanders of dollars won't want so many dollars if price of a dollar rises. But that doesn't make sense. Remember: US exporters demand dollars by supplying yen. They have *no use* for yen. They *want* to get rid of all their yen, regardless of how many dollars they get in exchange for it. Yen is useless to them and are willing to give it up for as many dollars as they can get for it.

No, the reason demand falls when exchange rate rises is *not* because US exporters don't *want* to demand dollars, but rather because they don't *have* yen to supply.

Why? Because of the way Japanese consumers behave. Remember our computer example? Let's have it again: an American computer costs $1,000, a Japanese computer costs ¥140,000.

If the exchange rate is ¥150 = $1, then the cost of an American computer *to* a Japanese consumer is ¥150,000. That is more expensive than a home-made Japanese computer. So Japanese consumers will switch, they will buy less American computers and buy Japanese computers instead. That means US exports decline, i.e. US exporters make *fewer sales* in Japan. And if they sell only a few computers to Japanese consumers, that means they only have a handful of yen to get rid of on the currency market. Thus their demand for dollars is low.

On the other hand, if the exchange rate is ¥120 = $1, then to a Japanese consumer, the cost of an American computer is merely ¥120,000. That is cheaper than a Japanese-made

computer. So Japanese consumers will flock to buy American computers. US exports to Japan increase, and US exporters will be flush with piles of yen - piles of yen they have to convert to dollars. So the demand for dollars will be high.

So:

Exchange rate rises → US exports to Japan decrease → Demand for Dollars (= Supply of Yen) on foreign currency markets declines.

Exchange rate falls → US exports to Japan increase → Demand for Dollars (= Supply of Yen) on foreign currency markets increases.

Simple enough?

Similarly for the supply curve. This time focus on the US consumer. When the exchange rate is *low* ¥120 = $1, that means the Japanese computer costs $1,1166, quite more expensive than the American equivalent ($1000). So American consumers buy less Japanese imports and buy more American goods. So *Japanese* exporters now have fewer sales in the US, thus fewer dollars they need to convert to yen. So supply of dollars is low. Similarly, if the exchange rate rises to ¥150 = $1, then Japanese computers cost $933, which is relatively *cheap* to US consumers, so Americans will import tons of computers from Japan. Japanese exporters are now flush will dollars they have to convert to yen.

So:

Exchange rate rises → US imports from Japan decrease → Supply of Dollars (= Demand for Yen) on foreign currency markets is less.

Exchange rate falls → US imports from Japan increase → Supply of Dollars (= Demand for Yen) on foreign currency markets is greater.

In a nutshell:

Appreciation: an increase in the value of a currency relative to other currencies.

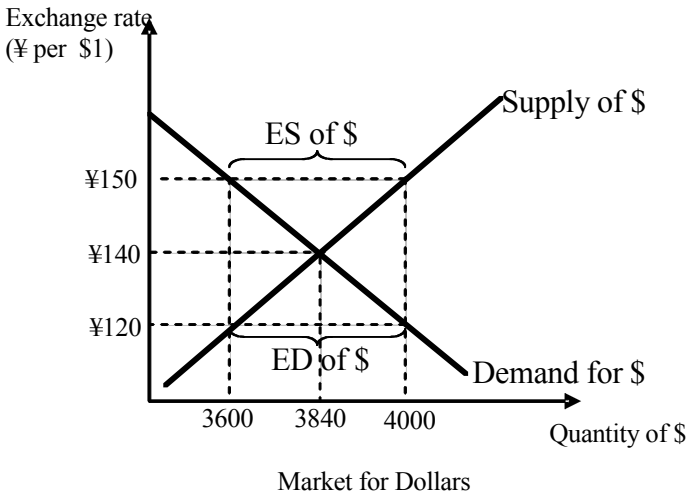
When the dollar appreciates, American goods become *more expensive* to foreign consumers while foreign goods *become cheaper* to American consumers. So US exports abroad decline, and US imports from abroad increase. i.e. when exchange rates rise, the demand for dollars decline and the supply of dollars increase.

Depreciation: a decrease in the value of a currency relative to other currencies

When the dollar depreciates, American goods become *cheaper* to foreign consumers while foreign goods *become expensive* to American consumers. So US exports abroad increase, and US imports from abroad decline. So, when exchange rates fall, that necessarily means the demand for dollars decreases and the supply of dollars increase.

EXCHANGE RATE MOVEMENTS

Now, let's put it all together in one diagram:



Market for Dollars

You can guess the conclusion: the exchange rate will be where X marks the spot, that is, at ¥140 = $1.

The question is how it gets there. By the Law of Supply & Demand, naturally!

This can be quickly seen.

- Suppose exchange rates are below equilibrium, e.g. ¥120 = $1. US exports to Japan are 4000, which means demand for dollars is 4000, while US imports from Japan are merely 3600, which means supply of dollars is 3600. There is an *excess demand for dollars* on the market.

Now, you know by the law of markets, if there is an excess demand for a good, then necessarily the price of that good rises. So if the exchange rate is below equilibrium, *necessarily* the price of dollars rises, i.e. the dollar *appreciates* (reciprocally, the yen depreciates).

(Intuitively: when there is an ED for $, that means there are a lot of US exporters running around with lots of yen, all trying to convert them into dollars, but there are only a few Japanese exporters with dollars who need yen. US exporters will hone in on the few Japanese exporters and try to get a hold of their scarce dollars by offering more yen for them, i.e. by their competitive bidding, they will drive up the price of the dollar in terms of yen.)

- When exchange rates are above equilibrium, e.g. ¥150 = $1, US exports decline to 3600 while its imports rise to 4000, that means demand for dollars is 3600, while supply of dollars is 4000. We are in a situation of *excess supply of dollars*.

Again, by the law of markets, when there is an excess supply of a good, price falls. In this case, we have an excess supply of dollars. So *necessarily* price of dollars falls. (too many dollars, not enough yen.) The dollar *depreciates* (or reciprocally, the yen appreciates).

So wherever we start, the exchange rate *will adjust* and drive us to equilibrium rate of ¥140 = $1 from both sides. At equilibrium, US exports are 3840 and US imports are 3840, which means the demand for dollars is equal to the supply of dollars. Market clears. The exchange rate doesn't need to continue adjusting.

The Law of Markets will settle the exchange rate where demand for dollars equals supply of dollars (and thus, reciprocally, where supply of yen equal demand for yen).

Zero Trade Balance?

The dynamics of everything we have said above is true. Excess demand for dollars drives up the exchange rate, excess supply pulls down the exchange rate.

But there is a little annoying footnote in our story.

Notice that at equilibrium, the demand for dollars = supply of dollars. But we said that US exports = demand for dollars. And US imports = supply of dollars. So does that mean that at equilibrium we necessarily have it that US exports = US imports? That is, that the trade balance is *zero* at equilibrium?

Consider the disequilibrium case when exchange rate is ¥150 = $1. Here demand for $ (= US exports) = 3600 and supply of dollars (= US Imports) = 4000, which implies we have a trade deficit (imports exceed exports by 400). But the story we just told is that excess supplies & demands are unsustainable. By the law of markets, the price (i.e. exchange rate) will fall to equilibrium, and our trade deficit will be instantly "fixed"!

It makes sense to some degree: as exchange rates fall from ¥150 to ¥140, American exports increase (US goods become more attractive to foreign consumers) and American imports fall (foreign goods become less attractive to American consumers). So we should see the trade deficit narrow. But to vanish completely when we finally hit equilibrium?

We hear in the news about how the trade deficit is huge, and has been huge and persistent for years. Yet exchange rates are relatively stable. Well, they may fluctuate a bit, but they're not dropping like a stone. Is our theory wrong?

Well, our theory is not wrong. It's just incomplete. In fact, I have been misleading you a bit about how exchange rates are determined. To see the complete story, we have to turn to the "balance of payments" of a country.

THE BALANCE OF PAYMENTS

We've been very fast & loose in our previous section and reached the preliminary conclusion that a trade surplus will lead to a currency appreciation and a trade deficit will lead to a currency depreciation.

But that is not quite true. For there are more actors at play in international transactions then merely exporters and importers of goods. We assumed in our story that the *only* people demanding US dollars were American exporters who were trying to get rid of their yen. But there is *another* class of people that are demanding US dollars: namely, Japanese *savers* who want to buy American ***assets***.

The savings of Japanese citizens are usually placed in Japanese banks, insurance companies, pension funds, etc. These Japanese financial institutions might want to hold a part of their wealth portfolios in American assets, e.g. in US company stocks, in US government bonds, real estate in Nevada, etc.

These financial institutions receive their funds from Japanese savers in yen, but to *buy* these American assets they need to have dollars. So every time they buy a new US asset, *they* demand dollars & supply yen on the foreign exchange market.

So the *demanders* of dollars (& suppliers of yen) = US exporters + Japanese savers who want to buy assets in the US.

While the *suppliers* of dollars (& demanders of yen) = Japanese exporters + American savers who want to buy assets in Japan.

So *just because* US has a trade deficit with the Japan (i.e. more imports than exports) *does not necessarily* mean that the currency will automatically change. It may very well be that Japanese banks decide they want to buy a lot of American assets and so *they'll* mop up the excess supply of dollars and offer a lot of yen.

So, there are actually *two accounts* that we need to pay attention to:

Trade Balance: Exports of goods & services minus imports of goods & services.

Net Foreign Investment: (= Net Foreign Flow of Funds): Purchases of domestic assets by foreign savers minus purchases of foreign assets by domestic savers.

When added together, we obtain what is called the *"Balance of Payments"* (or *BoP*)

Balance of Payments = Trade Balance + Net Foreign Investment

This is a rough-and-ready definition of the Balance of Payments -- and good enough for our purposes.

[WARNING:# 1 - the word "investment" is being used horribly confusing way here. It isn't really "investment" in the proper economic sense of the term (i.e. firms accumulating new machines). It is flows of savings towards the purchasing of assets (bonds, stocks, etc.) - that is, the ugly financial sense of the term. I thought about omitting all reference to the word "investment" and simply calling it NFFS (Net Foreign Flow of Savings), which is what it is, but unfortunately the "NFI" nomenclature has become so common in international circles, that you are bound to come across it expressed like that. Please don't get confused. It is NFFS. It is not investment in the real economic sense.

To see the problems this confused nomenclature causes, think only of interest rates. By this time, you should be drilled to thinking that a rise in interest rates will lower investment spending by firms. Which it does (more expensive to borrow, etc.). But a rise in interest rates will attract savings. Because of this horrible NFI nomenclature you might see confusing phrases like "higher interest rates will attract investment" - what they mean is "higher interest rates will attract *savings*, i.e. prompt savers to buy more interest-yielding assets; but those higher interest rates are actually going to *discourage* investment (i.e. firm spending on new capital)." Please take pause when you see this word in the international context. If you find yourself getting confused, just repeat the mantra: NFI is NFFS.)

[WARNING #2: A more "proper" nomenclature for the BoP would be:

Balance of Payments = Current Account + Capital Account

where Current Account = Trade Balance plus some other minor things (e.g. gifts, remittances, investment income), Capital Account = net foreign flow of savings (NFI) in a little more expanded sense. I'm going to stick to the BoP = TB + NFI definition since it's a little more straightforward. If you're interested in the breakdown of the official BoP, the appendix gives more details.]

NET FOREIGN INVESTMENT

Net Foreign Investment (sometimes also referred to as the "Capital Account", but, remember, really means the Net Foreign Flow of Funds) can be in surplus or deficits.

We say there is a **NFI *surplus*** if the amount of foreign "investment" in your country (domestic assets bought by foreign savers) exceeds the amount your citizens invest in foreign countries. A country with a NFI surplus is sometimes known as a ***net debtor*** to the world.

There is a **NFI *deficit*** if the amounts foreigners invest in your country is less than the amount you invest abroad. A country with a NFI deficit is sometimes known as a ***net lender*** to the world.

What sort of things are counted in the NFI of a country?

Purchases of assets by foreigners in your country can be divided roughly into the following four types:

(1) **Direct investment**: (FDI) foreigners engaged in direct purchasing of assets, e.g. setting up/buying up entire domestic firms, buying domestic real estate, etc.

(2) **Security purchases**: foreigners purchasing domestic stocks & bonds.

(3) **Bank deposits**: foreigners holding deposits in your domestic banks.

(4) **Government assets**: foreigners holding domestic government securities (e.g. Treasury Bills & Bonds). This includes foreigners holdings of domestic cash (notes & coins).

Investment by domestic citizens abroad are just the opposite (i.e. domestic firms buying overseas companies, buying foreign stocks, foreign government bonds, etc.)

Excluded from the NFI are Central Bank-to-Central Bank purchases & sales. For instance, if the US Federal Reserve buys euros, or the ECB buys US dollars, that is *excluded* from the NFI It is included in a separate sub-category called **Official Reserves Account**.

FIRST CAVEAT: NFI does not tell us how many domestic assets foreigners *own* in a country (or vice-versa). It tells us how much many *new* domestic assets they *purchased* this year. So, in any given year, NFI numbers may show that, say, foreigners didn't buy *any* assets *that year*; but they might still *own* assets they bought in *previous* years.

SECOND CAVEAT: Yearly income from these assets (profits, dividends, interest payments, etc.) that go to foreigners are *not* counted in the NFI numbers. They usually form a sub-category of their own ("Net Investment Income"), usually added to the trade balance in the Current Account.

BALANCE OF PAYMENTS EQUILIBRIUM

So, let us correct what we said before:

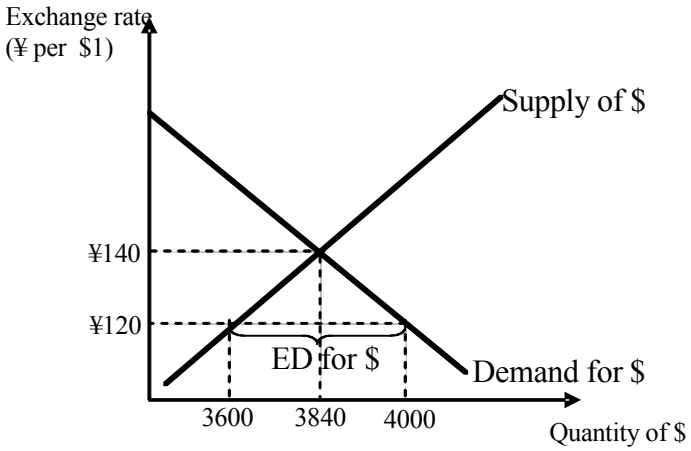
As long as the Balance of Payments is zero, then there is *no* pressure on the currency to appreciate or depreciate. When Balance of Payments is neither in surplus nor in deficit (= 0), then it must be that the Trade Balance = (the negative of) NFI.

Suppose that the equilibrium exchange rate is ¥140 = $1, but for some reason, the exchange rate is temporarily stuck at ¥120 = $1. e.g. in the diagram below. At this lower exchange rate, the US has a trade surplus of $400 with Japan and (equivalently) Japan has a trade deficit of $400 with the US. Suppose there is no foreign investment across borders. That means NFI is zero for both. So:

US BoP = $400 (trade surplus)

Japan BoP = -$400 (trade deficit)

All else being equal, there is pressure for the yen to fall and the dollar to rise.



Market for Dollars

But now suppose that, out of the blue, an American insurance companies decide that buy up a ¥48,000 plot of land in Kyoto that it recently found. As the exchange rate is ¥120 = $1, the American insurance will go to the foreign exchange markets and *offer* $400 to buy up ¥48,000 yen. For the US this means that US investment abroad increases by $400. Since we have assumed nothing about foreign investment in the US, that means the US suddenly has an NFI deficit of $400. So, the implications for the *American* Balance of Payments are:

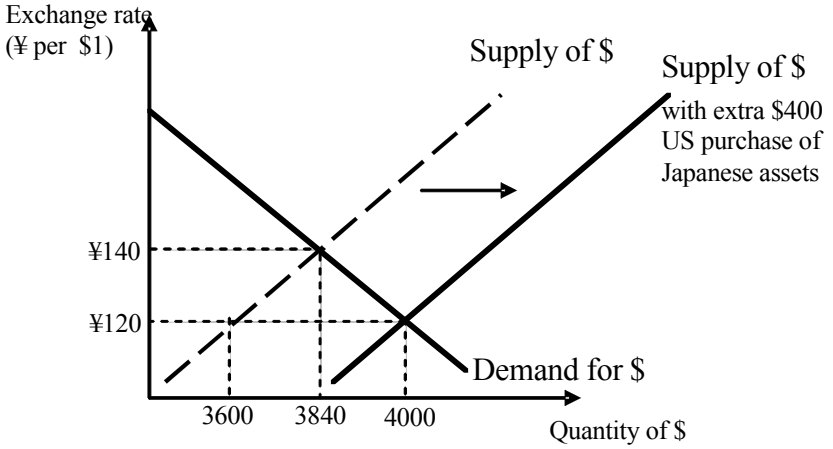
US BoP = $400 (trade surplus) - $400 (NFI deficit) = 0.

The US balance of payments is neither in surplus nor deficit. Equivalently, for *Japan*, that means an increase in foreign investment in their country, so for Japan has an NFI surplus of $400.

Japan BoP = - $400 (trade deficit) + $400 (NFI surplus) = 0.

So the Japanese Balance of Payments is also neither in surplus nor deficit. So there is no pressure for the dollar-yen exchange rate to change.

Diagrammatically, the sudden US purchase of Japanese assets has *increased* the Supply of $ on the market, thus making ¥120 = $1 the new equilibrium.



Market for Dollars

So it is perfectly possibly for exchange rate to be stable and have a persistent trade surplus (or trade deficit), so long as the NFI deficit/surplus is of the same size and the opposite sign.

With the TB and NFI now in play, we need to slightly adjust our thinking of our demand and supply curves. To reiterate:

Demand for dollars (reciprocally, supply of yen) is the quantity demanded of dollars by US exporters *plus* Japanese citizens who want to buy assets ("invest") in the US.

The demand curve is downward-sloping for the *same* reasons we gave before: the more the dollar costs, the more expensive American goods are to Japanese consumers and thus the less US goods are exported & sold to Japan. (i.e considerations of assets do not affect the shape of our slopes - their shape is still driven by material exports of goods)

Supply of dollars (reciprocally, demand for yen) is the quantity supplied of dollars by Japanese exporters *plus* American citizens who want to buy Japanese assets.

The supply curve is upward-sloping for the *same* reasons we gave before: the more the dollar costs (i.e. cheaper the yen), the more attractive Japanese goods get to American consumers and thus the more Japanese goods are exported & sold to US.

As before, the Law of Markets will settle the exchange rate where demand for dollars equals supply of dollars (and thus, reciprocally, where demand for yen equal supply of yen). At that price, there is a Balance of Payments equilibrium, i.e. Balance of Payment = TB + NFI = 0, for both countries. But *that does not necessarily mean that we have a trade surplus/deficit of zero* at equilibrium. Rather, it means we have a *Balance of Payments* of zero at equilibrium.

Look at the numbers in our example again. At ¥120 = $1:

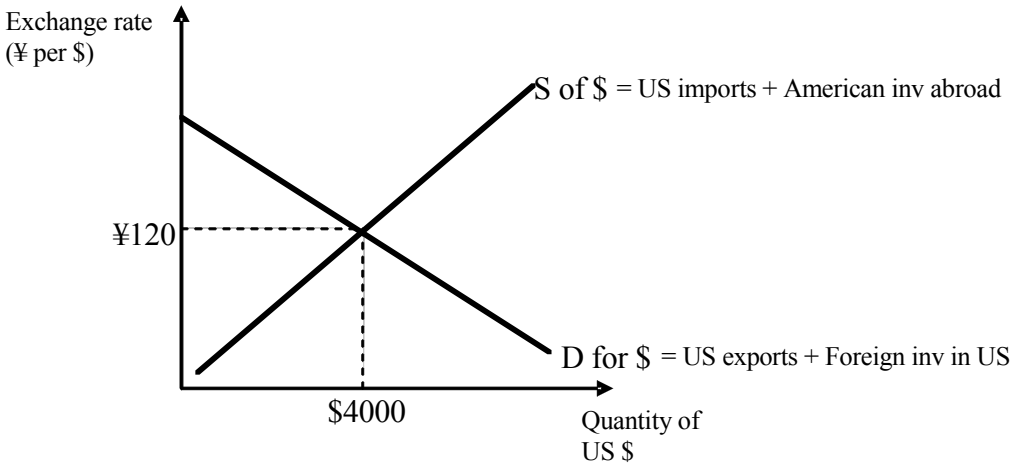
Demand for US dollars = $4000 (from US exporters) + 0 (no Japanese want to invest in US) = $4000

Supply of US dollars = $3600 (from Japanese exporters) + $400 (from Americans wanting to invest in Japan) = $4000.

They are equal. But, converting to dollars, Japan is running a trade deficit ($3,600 - $4000) = -$400, but an NFI surplus ($400). So the Japanese balance of payments = TB + NFI = -400 + $400 = 0.

Equivalently, the US is running a trade surplus ($4000 - $3,600) = $400, but running a NFI deficit (-$400). So the American balance of payments = TB + NFI = $400 - $400 = 0 as well.

So, equilibrium *doesn't mean* the trade balance is zero. A trade deficit can be run, as long as a there is a sufficiently high NFI surplus to cover it. There is no pressure to change the currency.



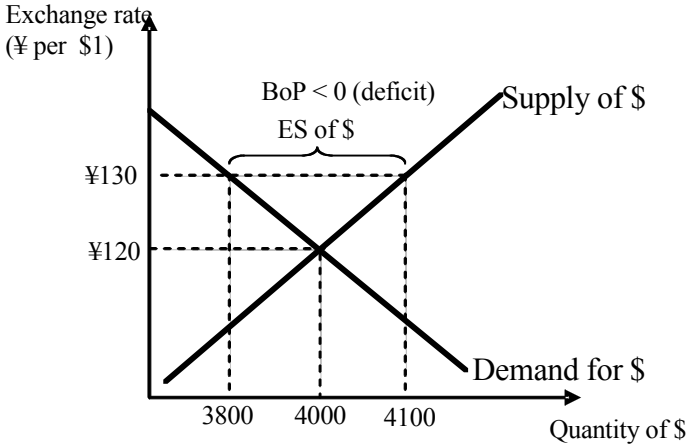
BALANCE OF PAYMENTS DEFICITS & SURPLUSES

In our prior example, with exchange rate at At ¥120 = $1, we said US exports to Japan = $4000, US imports from Japan = $3600, Foreign investment in US = 0, US investment abroad = $400.

Suppose the exchange rate, for some reason, is too high (e.g. ¥130 yen per dollar), then we are in a situation that supply of dollars exceed the demand for dollars -- and the Balance of payments are in *disequilibrium*.

How do we know? Well, assume for the moment that the NFI don't change (i.e. the only investment is still by the Americans buying $400 worth of land in Japan). But, as we explained earlier, the trade balance (i.e. exports & imports) changes in response to currency movements. At the "stronger" ¥130-worth. dollar, American goods get more expensive and Japanese goods become cheaper.

So, at ¥130 = $1, American exporters sell less in Japan than before, say exports decline from $4,000 to $3,800, while US imports surge from 3,600 to 3,700. At ¥130 = $1, the *total* demand for dollars is $3,800 (from US exports), but the *total* supply of dollars is $4,100 (= $3,700 supplied by Japanese exporters + $400 from the US investors in Japan). There is an excess supply of dollars. Diagrammatically it would look something like this:



Market for Dollars

Notice that the Balance of Payments are no longer in equilibrium.

US B of P = TB + NFI = ($3, 800 - $3,700) - $400 = -$300

i.e. US still has a trade surplus (+$100), but it is now running a Balance of Payment *deficit* of (-$300).

Equivalently, the Japanese balance of payments is now:

Japan B of P = TB + NFI = ($3,700 - $3,800) + $400 = +$300

i.e. Japan still has a trade deficit (-$100), but it has now a Balance of Payments *surplus* of +$300.

The same applies the other way. If exchange rates fall to ¥110 = $1, US exports increase, US imports fall, and the end results will neecessarily be a US Balance of Payments *deficit* and a Japanese Balance of Payments *surplus*.

Balance of Payments & Currency Markets:

It is useful to think of the Balance of Payments as essentially an expression for the excess demand for dollars. That is, we defined BoP = TB + NFI. But we can also define it as BoP = Demand for $ - Supply of $. To reiterate the connection, remember we said:

Demand for $ = US exports + Foreign "investment" in the US

Supply for $ = US imports + American "investment" abroad.

Let us define the Balance of Payments as the excess demand for dollars, that is:

Balance of Payments = Demand for $ - Supply of $

then using the definitions of demand and supply of $:

BoP = (US exports + Foreign inv in US) - (US imports + American inv abroad).

Opening the brackets (remember to watch the switch in signs)

BoP = US exports + Foreign inv in US - US imports - American inv abroad

And making some new brackets:

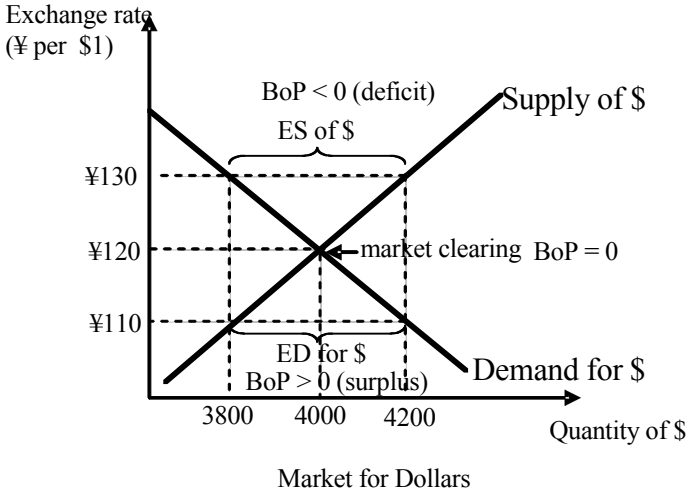
BoP = (US exports - US imports) + (Foreign inv in US - American inv abroad)

Ta-da! Here we have the expression for:

Balance of Payments = Trade Balance + Net Foreign Investment.

So:

Balance of Payments < 0 (deficit) $\Rightarrow$ Demand for $ < Supply of $ (excess supply of $)
Balance of Payments = 0 (balanced) $\Rightarrow$ Demand for $ = Supply of $ (market clear)
Balance of Payments > 0 (surplus) $\Rightarrow$ Demand for $ > Supply of $ (excess demand of $)



Market for Dollars

It is easy to see that for the US, if exchange rate is too high (¥130 = $1), we have an excess supply of dollars means a US Balance of Payments surplus. Whereas if exchange rate is too low (¥110 = $1), we have an Excess demand for $ means a Balance of Payments deficit. And that if the exchange rate is just right (¥120 = $1), the market clears (Demand for $ = Supply of $) and we have a zero (or "balanced") balance of payments.

Balance of Payments & Exchange Rate Movements

We know excess demands and excess supplies on a market are not stable. If ¥130 = $1, we have an excess supply of $. Excess supplies of anything will not stay put. The price will adjust. In our case, the exchange rate will adjust. So unleashing the law of markets, that will lead to a *depreciation* of the dollar (appreciation of the yen), so that the exchange rate falls back to ¥120. So trade deficits/surpluses do *not* necessarily indicate in which direction the currency is going to move anymore. You have to look at the *entire* Balance of Payments surplus/deficit to predict it.

Law of Foreign Exchange Markets:

- Balance of Payments deficit of a country leads to a *depreciation* in that country's currency.
- Balance of Payments surplus of a country leads to an *appreciation* in that country's currency.

So trade deficits/surpluses by themselves do not cause currency appreciations/depreciations. It is *balance of payments* deficits and surpluses (trade balance *plus* net foreign investment) that cause exchange rates to move. In sum:

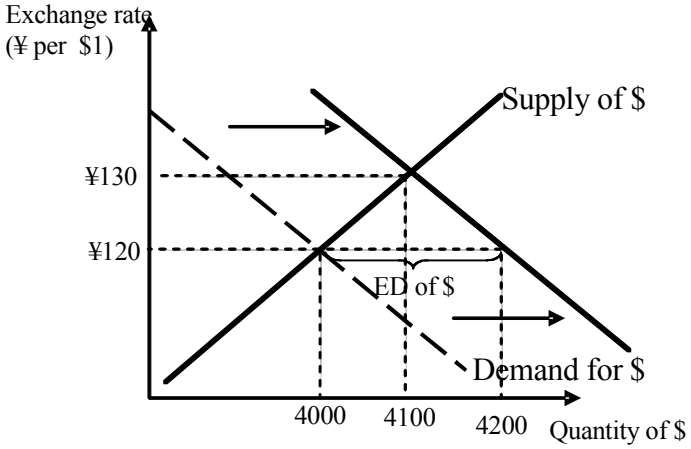
Balance of Payments < 0 (deficit) $\Rightarrow$ ES of $ $\Rightarrow$ exchange rate fall
Balance of Payments = 0 (balanced) $\Rightarrow$ Market clears $\Rightarrow$ exchange rate stable
Balance of Payments > 0 (surplus) $\Rightarrow$ ED for $ $\Rightarrow$ exchange rate rise

BALANCE OF PAYMENTS SHOCKS

We know the exchange rate will settle where D for $ = S of $, i.e. where Balance of Payments = 0.

Our description of markets helps us also decipher how sudden shocks of some sort can change the exchange rate.

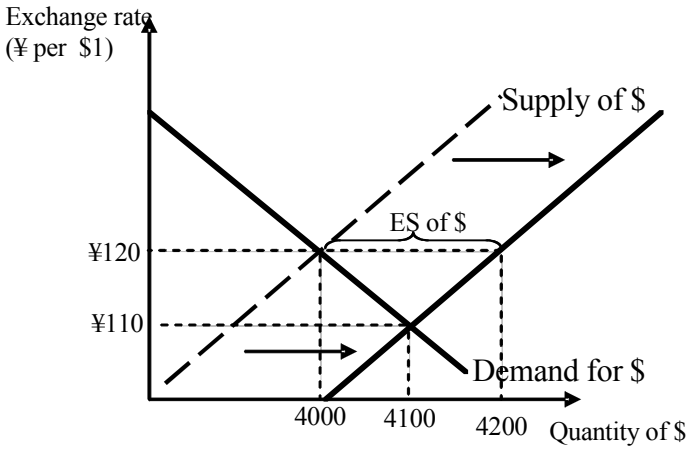
Suppose there is a wave of popular western movies means there is a sudden increase in Japanese demand for American cowboy hats. That is a sudden surge in US exports to Japan. US companies now suddenly have a lot more yen, which they need to exchange for dollars. Diagrammatically, this kind of external shock is represented by a rightward *shift* in demand for dollars.



Market for Dollars

Now, if we try to keep the exchange rate stable ¥120 = $1, this sudden increase in demand will create a yawning excess demand for dollars (= balance of payments surplus). There is no way that the exchange rate can stay stable. Thus the exchange rate will rise to clear the currency markets and restore balance of payments to zero.

Suppose another shock. Let us suppose interest rates on Japanese government bonds increase. All of a sudden Japanese bonds are more attractive for US savers to hold and US banks, pension funds, etc. will rush to buy them. That is an increase in US "investment" abroad (I warned you the word could be confusing - "investment" = flow of savings funds to buy Japanese assets). Diagrammatically, that is represented by a *shift* in the supply of $ (intuitively, they rush to convert their US dollar savings into yen in order to buy the new high-yielding Japanese bonds).



Market for Dollars

Again, if we try to keep the exchange rate stable ¥120 = $1, this sudden increase in supply f $ (demand for yen) will create an excess supply of dollars (balance of payments deficit). Thus the exchange rate will fall.

In fact, we can pretty much decipher the impact of *any* kind of thing on thecurrency markets by figuring out how it will channel through. By our definition of demand & supply for $:

Demand for $ = US exports + Foreign "investment" in the US

Supply for $ = US imports + American "investment" abroad.

Notice there are four things listed: US exports, US imports, Foreign investment in the US, and American investment abroad. Anything (other than exchange rate itself) that affects any of these four things will lead to a *shift* in either the demand or supply of $, and thus change the equilibrium exchange rate.

(Note: I exclude movements in the exchange rates itself because that is already captured in the *slope* of the demand & supply curves.)

So:

- a sudden change in US exports will shift the demand for $
- a sudden change in US imports will shift the supply of $
- a sudden change in foreign investment in the US will shift the demand for $
- a sudden change in American investment abroad will shift the supply of $.

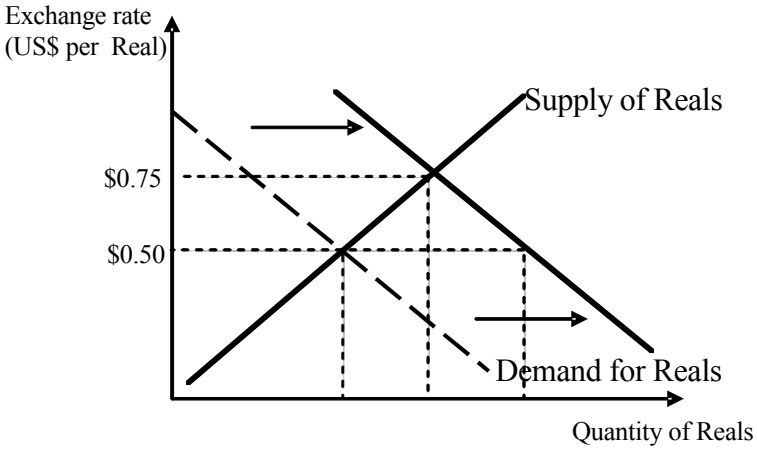
What kind of things? Anything you can think of - changes in consumer tastes, tariffs, yields on bonds, stock market bubbles, inflation, recessions, etc. You can deduce their impact of any economic phenomenon on exchange rates by figuring out *which* of the four channels that shock will affect (and in what direction), and then shifting the relevant curve accordingly.

DUTCH DISEASE

In late 2007, Brazil found a massive oil reserves off its coast. A blessing you might think? Particularly at a time of high oil prices. Well, Brazilian government got quite nervous about the news - they worried because they remembered the curse of the "Dutch Disease".

This refers to the experience of the Netherlands back in the 1960s. The Dutch found large oil reserves in the North Sea: the country went quickly into a recessionary spiral - factories shut down, unemployment rose, etc.

Why? The reason is easily explained. Oil being in high demand in the world, a country with a huge resource boom will increase its exports massively. With its magical oil find, Brazil can expect a huge increase in exports to the rest of the world. This will affect currency markets by shifting the demand curve for Brazilian *reals* to the right. In other words, Brazil will receive a huge influx of foreign currency (dollars, etc. often nicknamed "petrodollars") as foreigners rush to buy Brazilian oil.



Market for Reals

The sudden surge in demand for *reals* will increase the exchange rate of the Brazilian *real* quite sharply. And this will adversely affects all *other* Brazilian industries - textiles, computers, automobiles, etc. That is because when exchange rate rises, *their* goods are now more expensive to foreign consumers. So foreigners will import *less* Brazilian textiles, computers, etc. Moreover, a high exchange rates makes foreign goods *cheaper* to Brazilian consumers, and many Brazilians will switch from buying Brazilian goods to buying buying foreign goods. All Brazilian industries (other than oil) will thus face falling demand both abroad and at home. Thus Brazilian firms (other than oil) are in danger of being driven out of business and forced to shut down, increasing unemployment, provoking the recession - indeed, maybe "deindustrializing", shutting down entire critical gateway industries like textiles and manufacturing, -- all because of the "luck" of finding these huge oil reserves.

Sovereign Wealth Funds

The "Dutch Disease" is a real worry for countries which find a sudden resource boom like oil.. Aware of this problem, the governments of "lucky" countries try to neutralize the effect of their resource boom by "locking away" the revenues from the boom in a lockbox outside the country, and do not allow them to be converted into domestic currency.

e.g. Norway, another "blessed" oil-exporter, keeps its influx of "petrodollars" in a "national pension fund" which is explicitly instructed to use that that foreign currency to buy assets abroad (e.g. US real estate, etc.) and *avoid* buying Norwegian assets (because that would increase the demand for Norwegian krona, thus resuming the "Dutch Disease".) Russia has done the same - setting up a "Stabilization Fund" in 2003 to lock away foreign currency influxes from its huge oil and natural gas. Oil-exporting Persian Gulf countries (Abu Dhabi, Kuwait, etc.) have run such funds for a while.

Such lockboxes are known as **sovereign wealth funds**. And because they are instructed to hold foreign assets (rather than domestic), these funds have become major players in international financial markets - using their petrodollars to buy up stocks, bonds, real estate, etc. around the world, everywhere but at home..

But other countries have been less careful. The governments of Venezuela and Nigeria, for instance, allowed their petrodollars into the country - and have suffered severe effects of Dutch Disease (i.e. the loss of their non-oil sectors, and increasing dependence of the economy on oil alone, and high unemployment and high inflation problems.)

Mexico also mismanaged its oil windfall and suffered from a lot of Dutch Disease effects. Even more lamentably because it squandered a golden opportunity to industrialize in the 1990s. With the passage of NAFTA, Mexico gained what few other countries had at the time: tariff-free access to a gigantic consumer market (the USA). Mexico's fledgling manufacturing industries were poised for take-off. But the surge in oil revenues appreciated the Mexican peso immensely, with the result that non-oil Mexican exports became instantly less attractive to American consumers. Mexican manufacturing industries were stifled.

The Dutch Disease applies not only to oil or natural commodity booms, but to any country which has a single or a few outsized booming sector relative to the rest of the economy . Singapore, for instance, generates a lot of foreign currency from its ports, and thus has taken to locking away of its foreign currency revenues in a sovereign wealth fund to prevent the exchange rate from rising and keep the rest of its industries in business.

Dutch Disease applies even to things such as **foreign aid** and **remittances** from emigrants abroad. While these are a blessing - a gift of cash from abroad - the problem is this aid is often in the form of *foreign* currency which needs to be converted to local currency. If the aid is given in a big lump at once, it will drive up demand for local currency sharply, thus raising exchange rates .... and all the subsequent problems of Dutch Disease. Thus foreign aid organizations are now more careful about how they disburse their money, trying to spread it over time, so that it doesn't cause a sharp sudden increase in exchange rates.

CAPITAL FLIGHT

Today (in the real world), the US has an enormous trade deficit with the rest of the world while Japan has an rather large trade surplus.

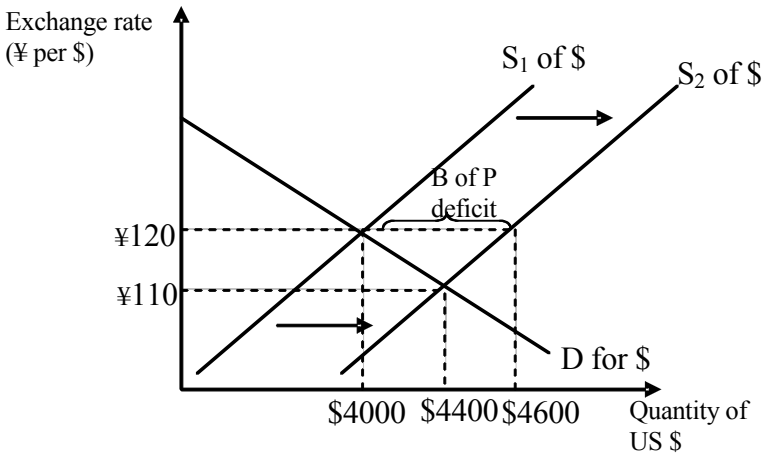
But the large US trade deficit is *sustainable* because foreign financial institutions are very happy to invest in the US. The trade deficit can be as large as it wants, as long as the net foreign investment in the opposite direction matches it. So, in and of themselves, trade deficits may be nothing to worry about if they are matched perfectly by a NFI surplus.

So why do countries worry so much about trade deficits? Because if you want to keep a trade deficit, you need large net foreign investment surplus. In other words, in order to keep your currency stable while running a deficit, you are very dependent on foreigners' willingness to continue investing in your country -- and hoping your countrymen don't invest too much abroad.

But what if the foreigners lose their nerve and decided to invest less? Or, worse yet, decide to *disinvest*, i.e. sell their assets & leave? If the foreigners go into a panic, they can sell off the assets they own in your country overnight, plunging your country's currency into a free-fall. This phenomenon is known as **Capital Flight**. It is a real problem for many countries, particularly small ones.

"Capital flight" away from a country will have the impact of *increasing* the supply of your currency. This is represented as a *rightward* shift in the supply curve (if we're looking at the market for the currency of the country).

In the diagram below, suppose that Japanese holders in the US sell off assets they had bought in earlier years. So, now they have a bunch of dollars and will try to convert them into yen to go buy assets back in Japan. So, they *increase* the supply of dollars (from the sale of the assets) and increase the demand for yen no matter what the exchange rate is. That is a right-ward *shift* in the supply of dollars curve.



In detail: beginning at our old exchange rate of ¥140 = $1, Suppose that Japanese banks sell off $600 worth of old US Treasury Bonds and try to convert the proceeds into yen (¥840 to be precise) they can take back home to Japan. Thus, total supply of dollars is now $4600. Breaking it down in the numbers used in our example:

Supply of US $ = $4600 = $3,600 supplied by Japanese exporters + $400 supplied by US investors wanting to buy land in Kyoto + $600 supplied by panicky Japanese investors trying to get rid of US assets.

There is going to be an excess supply of dollars. What does it mean in terms of balances of payments? Well, the capital flight comes in as a *credit* (+600) to the Japanese NFI and a *debit* (-600) to the US NFI, i.e.

US B of P = TB + NFI = ($4, 000 - $3,600) - $400 - $600 = -$600

Japan B of P = TB + NFI = ($3,600 - $4,000) + $400 + 600 = $600

So, *regardless* of the trade deficit/surplus situation, the US now has an enormous Balance of Payments deficit and Japan a rather large Balance of Payments surplus.

To clear the markets, the dollar has to depreciate (and the yen appreciate) to ¥110 per dollar.

This sudden jolt in capital flight has led to a dramatic collapse in the US dollar.

In real life, this is not *usually* a problem for big countries like the US & Japan. Lots of foreigners disinvest from them every day, but there are lots of others willing to replace them and invest. The US and Japan tend to be rather reliable investments; you are very unlikely to see a massive disinvestment of US or Japanese assets.

But with smaller countries, particularly developing countries, capital flight is a *huge* problem and can have devastating effects. Starting off in the 1990s, there were a cascade of international financial crises prompted by capital flights in Mexico in 1994, East Asia

(Thailand, Korea, Indonesia, Malaysia, etc.) in 1997, Russia, Brazil and Asia again (including Japan this time!) in 1998, Argentina in 2001, and so on.

What causes capital flight? This is difficult to say and many economists are still very puzzled about it. No two crises are exactly the same. They often start off for some obscure reason (hints, rumors, etc.), sometimes for a good reason (e.g. the 1998 flight from Russia was prompted by a default on Russian government bonds). But however it starts, the subsequent mechanics are more-or-less clear: once several big-name investors start pulling out, many other investors go into a panic and follow suit, turning a outward trickle into a huge cascade. Economists like to refer to this as **herd-behavior**.

Capital flight crises are not always confined to particular countries. They can also have **contagion effects** across countries. For instance, when investors began pulling out of Thailand in 1997 and sending the Thai Baht into a fall, investors in other "Thailand-like" countries -- nations like Korea, Indonesia and Malaysia -- also began doing the same.

What is the reason for herd-behavior & contagion? Well, not always a good reason. They just got nervous -- thinking something along the lines of the following:

> "If this can happen in Thailand now, then it is bound to happen in similar countries, like Korea, next. But if the Korean won is going to fall in the near future, the value of my won-denominated Korean assets (e.g. Korean government bonds, corporate stocks, etc.) will decline. So I'd better disinvest out of my Korean assets now and convert my won-denominated Korean assets to dollar-denominated assets (i.e. US assets) before the Korean won takes a free-fall."

So if enough people think like this and begin divesting their Korean assets, then capital flight occurs and the Korean won *will* take a free-fall. So the mere *fear* of a potential capital-flight in the future can *cause* an actual capital flight now. This is an example of what economists call a "**self-fulfilling prophecy**" (by thinking something is going to happen, I act in a way that makes it happen).

Herd-behavior, contagion effects, self-fulfilling prophecies -- all these are catchwords that have come into prevalence recently to describe the flighty nature of international capital movements.

GOVERNMENT INTERVENTION

How does a government -- more precisely, a Central Bank -- fight back at problems like capital flight? It uses something called *official reserves*.

Official Reserves: holdings of foreign currencies by the domestic Central Bank.

Every country has a Central Bank, e.g. the Federal Reserve in the US, the Bank of Japan in Japan, the Bank of England in the UK, the Riksbank in Sweden, the European Central Bank (ECB) in the Euro-zone (which took over the functions of the old Banque de France, the Bundesbank, Banca d'Italia, etc. in 1998)

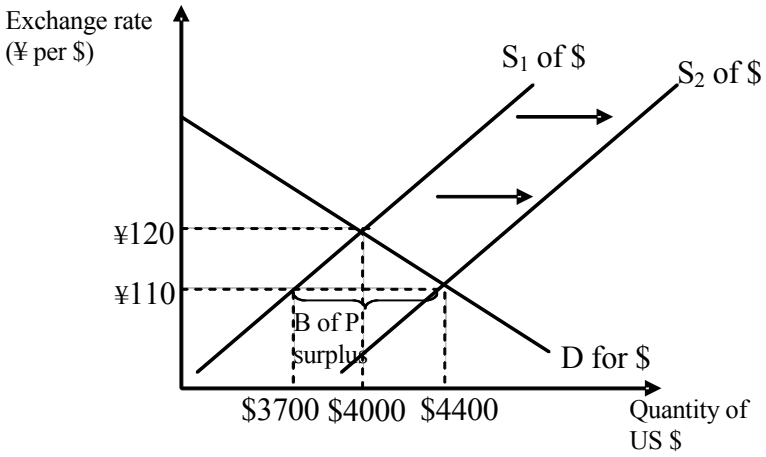
Central banks intervene on a daily basis in foreign exchange markets to *prevent* the exchange rate from moving around. The reasons for doing so are varied. We'll touch on this later. For now, let us address the question of *how* they do it.

Suppose the equilibrium exchange rate ¥120 = $1. But suppose, for some reason, the US government wanted to bring down the exchange rate to ¥110 yen per dollar (a "weak dollar" policy). They do so by engineering a *devaluation*.

Devaluation: reduction in the value of a country's currency by government intervention.

Revaluation: increase in the value of a country's currency by government intervention.

How do devaluations happen? Look at the diagram below. If the government just "declares" that the dollar is now worth 110 yen per dollar, this isn't probably going to work. There will be an excess demand for dollars (US balance of payments surplus). The currency will come back up to 120 yen.

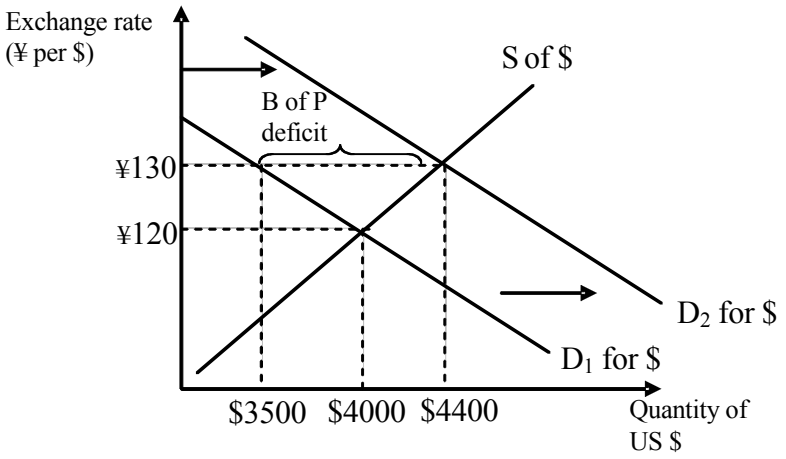


However, central banks have to power to **print** their own country's money (look at your the notes in your wallet -- they are "Federal Reserve" notes). So if there is a Balance of Payments Surplus (i.e. excess demand for your currency), the Central Bank has the option of just ***print*** the money to fulfill that excess demand (in the diagram, it would just print the

shortfall of $800 (= $4,400 - $3,700). That has the effect of *increasing* the supply of dollars. It shifts the supply curve to the right. The Federal Reserve will thus pump in enough dollars until the "new" equilibrium is ¥110 = $1.

So, if the government wants to devaluate the exchange rate, it is very easy: just print like mad and give the currency to the people who want it in exchange for their yen.

But the opposite case is more difficult. Suppose the US government wants to *increase* it to ¥130 (a "strong dollar" policy). By the same logic, you'd want to *increase* the supply of yen (shift the demand for US $ out to the right) so that the new equilibrium is up at ¥130 = $1.



But how are you going to do this? The Federal Reserve can print US notes. But it can't print the money of the Japanese government!

What Central banks have is what are called *official reserves*. **Official reserves** are the stocks of foreign currencies held by the Central Bank (see appendix for a more complete definition).

Remember our devaluation? The US Federal Reserve printed dollars and "gave" it to who wanted it. In return, it received yen. So it accumulated yen its official reserves.

So, in a revaluation, the US Federal Reserve can *release* these previously-accumulated yens onto the market, thus shifting the supply of yen (demand for $) curve outwards to the right, and achieve the higher exchange rate. This should make sense intuitively. If the US Federal Reserve floods the market with yen, the price of yen will fall relative to the dollar, i.e. the dollar will *rise* in value to something like ¥130.

In sum:
- Balance of payments surpluses can be financed by the Central Bank by printing domestic money.

- Balance of payments deficits can be financed by releasing foreign money from "official reserves" stores at the Central Bank.

Of course, the problem with using official reserves to finance deficits is that *they can run out*.

Again, remember that the Federal Reserve cannot print yen. So it cannot do this forever. Someday it will run out of yen -- and on that day, the demand for $ curve will shift back to its old position and the exchange rate fall back down to ¥120 = $1..

GOVERNMENT OBJECTIVES

Why might the US government want to keep the exchange rate above equilibrium, e.g. at ¥130 = $1?

(1) Stabilize Exchange Rates

Exchange rates are very volatile. They move up and down a lot. But contracts must be written up between importers and exporters. And they are hard to write up when exchange rates are so fluctuating & uncertain. You don't really know how much you're really going to be paying for imports by the time you receive them!

To make this easier, governments stabilize exchange rates by "filling in the troughs" (release foreign reserves & absorb domestic currency) and "shaving off the hills" (print currency & absorb foreign reserves).

(2) Stop Capital Flight

It may also want to intervene to "stem" capital flight. If capital flight (disinvestment) is merely a momentary panic, driven by herd-behavior, investors will come back to their senses soon and reinvest again soon, it is worthwhile to try to keep the currency stable.

(3) Internal Objectives

Exchange rate stability is one of the Central Banks' objectives. But it is not the *only* objective they have. Its other objectives include promoting employment & keeping inflation low. Printing & withdrawing money affects these domestic concerns as well.

It is often the case that the Central Bank's *internal* objectives conflict with its *external* objectives. The Central Bank may have good domestic reasons to *want* to (or have to) keep an exchange rate artificially high or artificially low. We shall give details of this connection later.

EXCHANGE RATE VOLATILITY

Suppose the government believes that the current exchange rate quoted on the market is not the real, long-run exchange rate, but only something temporary.

Suppose the exchange rate is at ¥120, but the government believes that its true, long-run value is ¥130. In that case it may be worthwhile to revalue the currency now from ¥120 to ¥130 and hold on. When things get back to normal over the long-run, the curves will shift to create a "natural" equilibrium at ¥130. On that day, the draining of yen from the official reserves will end.

"They believe" it is *really* ¥130 may sound like a will o' the whisp. Why do they believe this? Because of the fleeting nature of net foreign investment (NFI).

Balance of payments, remember, have two components: the trade balance (a "real" thing, about imports & exports) and net foreign investment (much of which is just "paper" investments).

Now, foreign investment forms a huge part of the demand for a currency -- much, much, much greater in size than the demand for currency stemming from the need to pay for imports of goods. There are more purchases and sales of foreign assets in a *single day* than there are imports/exports of goods in an entire *month*.

Speculation

What is going on with NFI? A good part of it is *speculation*.

Speculation: buying (selling) of an asset in the hope that its value appreciates (depreciates) in the near future, then selling it (buying it) again, making a profit from the price difference.

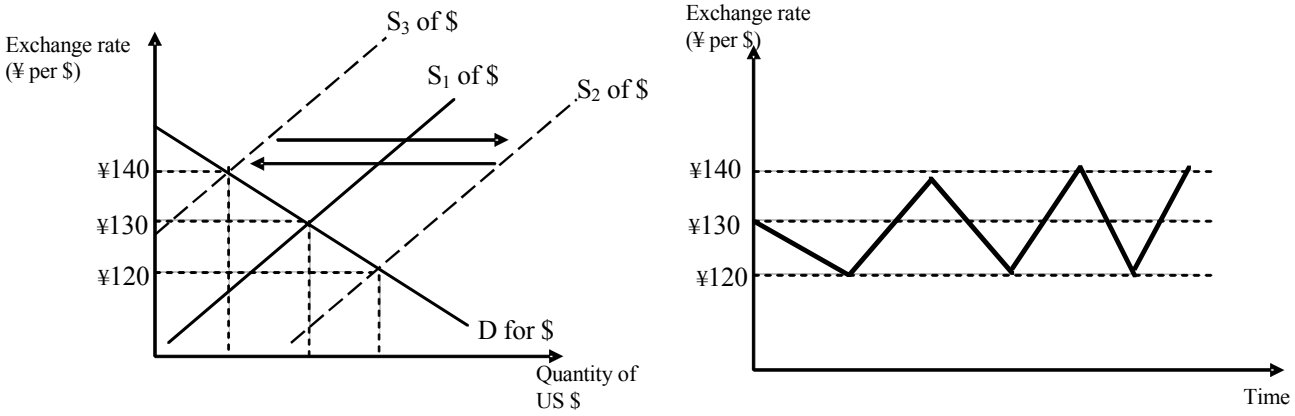
Now some capital investments are long-term, e.g. a Japanese pension fund buying American treasury bonds for the long-term in order to collect interest payments from them.

But speculators don't wait for interest payments. They are betting on the rising/falling prices of the US treasury bonds they buy/sell. They hope to make their gain quickly from price fluctuations on the bond market. They buy a bond one day, and then quickly sell it soon after (sometimes within a few hours), the moment its price moves in the right direction.

But net foreign investment (NFI) numbers don't differentiate between assets held on the long-term for income purposes & assets held only for the short-term for speculative purposes. So, the NFI can fluctuate quite wildly -- leading to lots of rises & drops in exchange rates. This phenomenon is known as **exchange rate volatility**.

NFI fluctuations lead to exchange rate volatility over time, as shown in the following diagram. The supply curve moves around, back and forth, causing exchange rates to

fluctuate between a high of 140 to a low of 120 and back again. Notice that *on average*, the exchange rate is 130. But, in actual fact, it is rarely ever there.



If currency depreciations/appreciations were allowed to follow every blip in the NFI, the currency's value would fluctuate like crazy. It is for this reason that Central Banks intervene daily by absorbing & releasing official reserves. Central Banks want to **stabilize** the exchange rate around what they think is the long-run average.

So, if the government believes ¥120 is a "blip" caused by speculators and that ¥130 is really the long-run value of the dollar in terms of yen (which will probably restore itself at the end of the week), they'd rather intervene and keep it at ¥130 throughout.

Speculative Attack

What if the government is wrong? What if the long-run average really is ¥120 rather than the ¥130 it is trying to stabilize around? Well, then eventually the reserves will drain and, probably at some point, the Central Bank will realize it is fighting against a "real" shift in exchange rates and let the currency depreciate to its new long-run value.

Sometimes it takes a while for a government to realize this. But private currency traders may believe so earlier and try to make a profit off the government's "mistake". This is sometimes known as a **speculative attack** on a currency (sometimes called a "**run**" on a currency.).

This is a problem many countries faced in the 1990s. Perhaps the most famous case of speculators breaking a powerful Central Bank happened in Europe in 1992.

Basically, back in 1992, the American financier George Soros launched a deliberate speculative attack on the English pound. Soros borrowed something like 6 billion (!) pounds from all sorts of commercial banks and flooded the foreign exchange market with them, i.e. he massively increased the supply of pounds, causing a balance of payments deficit in the UK. As usual, the Bank of England intervened, buying up the excess pounds with its official reserves of foreign currencies (primarily Deutsche marks) to keep the value

of the pound steady. But Soros kept borrowing more pounds & flooding the market. Other foreign investors, thinking Soros was up to something interesting, started copying him and doing the same.

The Bank of England kept intervening, its official reserves getting more and more depleted. Soros knew the Bank of England would run out of official reserves. All he had to do was keep flooding the market.

Soros won. He broke the Bank of England. The official reserves ran out and the Bank of England had no choice by to let the English pound depreciate -- an *enormous* depreciation against the Deutsche mark.

Soros, who had absorbed all the Deutsche marks the Bank of England had, was now *much* richer from appreciated & valuable Deutsche marks and calmly used them buy back all the (now depreciated & cheap) English pounds he needed to pay back his commercial bank lenders. The *profit* he made on this operation -- just a few days work -- was a staggering $1 billion!

Stabilizing Speculation

The Soros example may lead us to conclude that speculators are bad for the economy. That is unwarranted. In fact, speculation can be quite good.

Admittedly, a lot of NFI comes from speculators betting on exchange rate movements by buying/selling assets continuously throughout the day. But usually, speculation is not a problem because the amount of people betting an exchange rate will go up is more or less matched by people betting it will go down. If it is balanced in this manner, then it can very well be that speculation has hardly any influence on exchange rates.

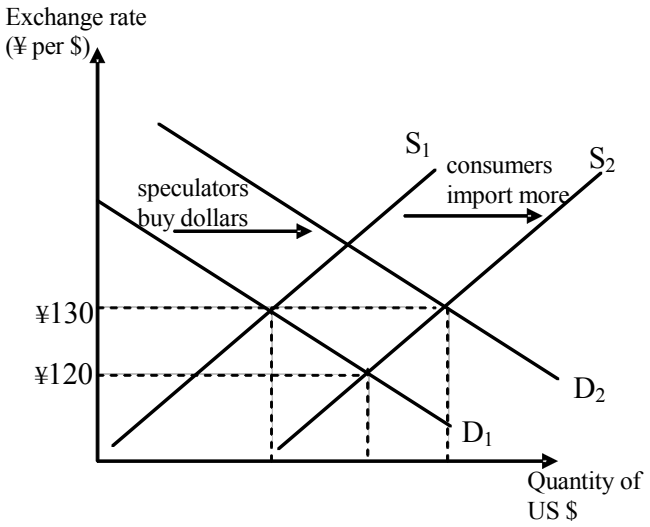
The volatility problem arises only if *a lot* of speculators bet in one direction, while hardly any of them bet in the opposite. It is in this case that speculation can cause some quite sharp & wide fluctuations in exchange rates that require government intervention. And if this speculation persists heavily on one side, the government may have a hard time trying to balance it out.

But speculators are not always destabilizing. Suppose, for the sake of argument, that there is absolutely no NFI and fluctuations in exports & imports are what is causing all the exchange rate volatility, e.g. suppose that US consumers are very fickle and change their demand for Japanese goods a lot. That means that the supply curve of dollars will be shifting up and down like before -- causing volatility.

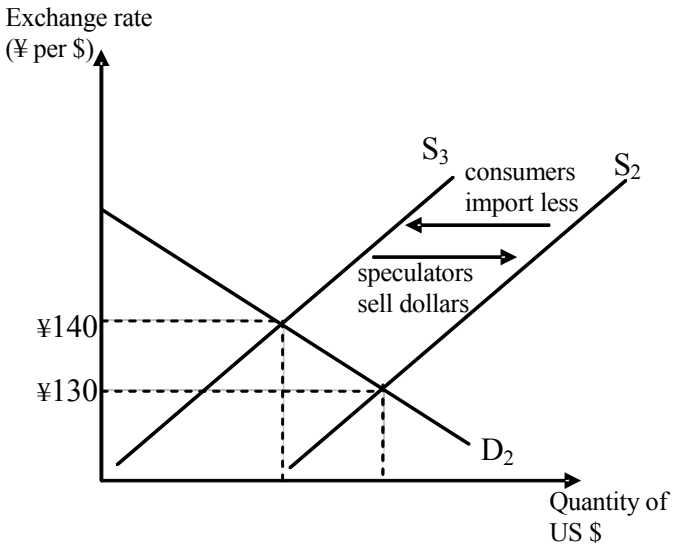
In this case, speculators can actually *help* stabilize things. If US demand for Japanese goods is really high in the Summer, and really low in the Winter, then the value of the dollar is going to fall in the Summer (e.g. to ¥120 yen per dollar) and rise in the Winter (¥140 yen per dollar).

Now, bring the NFI back in. Seeing the movements of exchange rates, a speculator will *buy* US dollars in the Summer and sell them in the Winter. That's the only way he can make a profit. It is exactly when US consumers are offering lots of dollars that he mops them up and exactly when they supply only a few that he sells them.

In detail: by *demanding* more dollars in the summer, the speculator is causing an independent rightward shift in the demand curve -- which will cause exchange rates to rise from ¥130 to ¥140. In the Winter, when exchange rate is high (¥140), he will sell those dollars (i.e. increase supply), thus bringing the exchange rate down to ¥130.



Summer Exchange Rates



Winter Exchange Rates

So, in this particular case, *speculators have reduced exchange rate volatility!* Without them, exchange rates would jump from ¥120 to ¥140 & back again. With the speculator's actions, the exchange rates stays around ¥130 throughout the year.

Perhaps the role of speculators in "causing" exchange rate volatility has been overstated?

Currency Futures

A final note is needed. You may have heard or read about *currency futures*. That is the private way of handling uncertainty about future exchange rates when government stabilization is simply not enough to make you comfortable.

If, say, you're importing some Japanese stereos which you will have to pay for in yen after they arrive, then you might not know how much they actually cost (in dollars) before then. To avoid this problem, you may wish to buy yen *in advance* at a fixed price.

This is what a currency **future contract** is. It promises you a certain amount of yen on a certain day in the future at a fixed price. That way, you don't need to worry about the value of the yen changing by the time you finally have to convert those dollars to pay for the stereos. Many importers/exporters buy currency futures in order to **hedge** against currency fluctuations.

Currency futures contracts are also traded on organized markets and also speculated upon, but they should *not* be confused with the *regular* currency markets (what are called "spot" currency markets). The exchange rate is determined in the latter alone. Many people believe that actual exchange rates and currency futures prices are related to each other, but the details of the connection are a bit too intricate to relate here.

Interestingly, the location of the main currency futures markets are not the same as the regular forex markets. Chicago, not New York, is the principal location for currency futures in the US, while Paris gives London a good run for the money in this category.

CENTRAL BANK COORDINATION

In 1992, Soros taught the Bank of England a "lesson" -- namely, that the resources of private speculators can sometime be larger than the Central Bank's reserves. But Soros' efforts could have been easily stopped if the German Bundesbank intervened and printed a ton of Deutsche marks. But it didn't -- despite all the frantic calls from London. So Soros was really betting that the Bank of England and the Bundesbank would fail to coordinate to foil him.

Frankly, it really makes no difference if the Deutsche mark was "revalued" by the Bundesbank printing them, rather than waiting for the Bank of England to drain its reserves. The result would be the same -- the mark would be revalued and the pound devalued. Only the Bank of England wouldn't have lost all its Deutche mark reserves in the process.

Traditionally, Central Banks have not been very cooperative with other Central Banks. Why this is so is often for political reasons. It is commonly held that low exchange rates are "desirable" for a country. Why? Well, low exchange rates, as we have seen, encourage exports and discourage imports, while high exchange rates discourage exports and encourage imports. Still holding on to "Mercantilist" thinking that "exports are good, imports are bad", many politicians think revaluation is a bad thing -- and so they often resist pressures to revalue the currency to help relieve the pressure on other countries. It is silly, but it is a political reality.

The Group of Seven

But sometimes political resistance can be overcome and coordination can happen. In 1973, five nations -- US, Japan, France, Britain and Germany -- got together at what was called the **Group of Five (G5)** meeting. The objective was to coordinate a revaluation of their currencies against the dollar. In effect, these other Central Banks were doing the US Federal Reserve a favor.

It is often said that the G5 were chosen because they were the world's "largest economies". But that was not entirely accurate. The real reason only these five countries got together is that most Central Banks in the world hold their currencies in their official reserves. The dollar, the yen, the pound, the franc and the mark (known as the "**hard currencies**") compose a huge proportion of *everybody's* official reserves.

The "club" of hard currency countries was expanded soon afterwards to the **Group of Seven (G7)**, to include Italy and Canada by 1976. And in 1997, Russia was invited, expanding it to **Group of Eight (G8)**.

Nowadays, the G8 meetings are less about currency coordination and a little more like a talk-shop for wider economic policies. This should be obvious because the Russian rouble is not widely held as an official reserve. Reflecting this fact, Russia is not a full member --

e.g. it cannot chair the conference and is excluded from the finance ministers' meetings. So the G8 is sometimes called the **G7-plus-one**.

It is also surprising that Switzerland has not been invited -- after all, the Swiss franc is one of the world's most widely-held hard currencies. To remedy things such as this, in 1999, the G7-plus-one sponsored the creation of a **G20** of next-in-line countries that it "consults" on international finance policies. This should not be confused with the **G24**, a coalition of finance ministers from developing countries, who are often critical of the G7 (and their G20 offspring). But the G24 -- unlike the G20 -- have little or no effect on G7 policy.

THE ROLE OF THE IMF

As the case of a country as large as England showed, nobody is completely immune from the dangers of capital flight & speculative attacks. In times of crisis, official reserves can (and sometimes do) run out.

Small countries are particularly prone to this problem. The official reserves of the Bank of Thailand in 1997 were simply not large enough to stem the capital flight and stop the collapse of the Thai baht.

In the Mexican crisis of 1994, the Banco de Mexico was luckier. With the Mexican peso under enormous pressure from capital flight, the US President Bill Clinton led an international rescue effort -- or **bail-out --** lending the Mexican government some US$50 billion ($20 bn. of that from US taxpayer money). The loan package gave the Mexican central bank enough dollar reserves to stabilize the peso and stave off the crisis. The loan has since been repaid.

But this helping hand was a one-time thing. For all sorts of reasons (political ones mainly), the US and other big countries don't often come to the "rescue" with bail-outs of troubled central banks -- indeed, Clinton's rescue of the Mexican peso faced vociferous opposition in the US Congress and it was a very unpopular measure among the US public.

Where might Central Banks go to borrow foreign currency reserves in times of crisis? They certainly cannot go to foreign commercial banks (i.e. borrow from Citibank or something like that) -- after all, they are usually part of the "herd" running away from a country!

But there is an alternative: the **International Monetary Fund (IMF)**.

The IMF was set up after the 1944 Bretton Woods accords between the major countries. The idea was that all countries would "pay into" a fund, creating a huge reserve account of currencies which could be lent to one of them in times of exchange rate crises.

[Technically: the foreign currency reserves of the IMF are pooled together, and every nation is given "Special Drawing Rights" (SDRs) on that pool, relative to the amount of they put in. SDRs are treated like an "artificial" currency and are traded between Central Banks.]

Bretton Woods System

From 1945 until 1973, when the world exchange rates were under what is called the "**Bretton Woods system**". The entire world was tied up in a "fixed exchange rate" system: every country's currency was supposed to stay at a particular value relative to the US dollar, while the US dollar itself was to stay a particular value relative to gold ($35 per oz., to be precise; the US held some three-quarters of the world's gold, most of it at Fort Knox). Devaluations of currencies relative to the US dollar (or the dollar relative to gold) could

happen, but they had to be agreed upon by all, approved of by the IMF and very good reasons given.

Of course, when countries tried to "fix" their currencies in this way, they needed lots of reserves to fend off intermittent capital flight & speculative attacks. This is what the IMF was created for: it was to be a lender of last resort to help countries stabilize exchange rates.

The Bretton Woods era was an era of relative peace and prosperity. But then a series of balance of payments crisis in France, Germany and the US in the late 1960s/early 1970s, prompted a breakdown of this arrangement. The final collapse came in August 1973.

After Bretton Woods

After 1973, governments were no longer required to stabilize their exchange rates at a particular level, but allowed to set them where they liked. The G5 meetings and other informal arrangements were made to help coordinate currency policy, but there was no long an agreed-upon "system".

Since the 1970s, the IMF has continued its role as a lender of last resort -- helping central banks fight off currency crises by lending them official reserves (dollars, gold, SDRs, etc.) in times of need.

But as there was no longer a "Bretton Woods" standard of exchange rates, the IMF noticed that many countries were trying to maintain highly unrealistic exchange rates -- and calling on the IMF repeatedly for loans of reserves to defend them. Now it was not the central banks' reserves that were being drained to defend exchange rates but rather, via loans, it was the IMFs own pooled reserves.

e.g. Consider our earlier example when the US Federal Reserve was trying to maintain a "strong dollar", an exchange rate of 130 yen per dollar when it is really supposed to be 120. If the Fed tried to maintain this all by itself, at some point, at some point the Fed's official reserves of yen would drain out and the exchange rate fall back to 120. But if the US could borrow yen from the IMF, then it could keep it going for longer. And, when that ran out, it could borrow more, etc. So the long-run effect of the Fed's strong dollar policy is that it would begin draining the IMF's own reserves of yen.

So, facing the drain of its own reserves, the IMF has essentially two choices: demand that all the world's governments pump more yen into the common pool ("**refinance**" the IMF) or **stop lending** to the US, i.e. demand that the US let its currency fall to 120 yen per dollar.

But there is a third option: namely, the IMF can **tie its loans to "conditions".** If the US is intent on maintaining an exchange rate of 130, the IMF will lend *on the condition* that the US government undertake particular structural reforms to ensure that the *natural* demand/supply of dollars will eventually stabilize at 130 yen per dollar.

In the 1980s, the IMF began doing just that. Its loans began being tied to **Structural Adjustment Policies** (SAPs). The IMF would lend to countries trying to maintain strong exchange rates, but it wouldn't lend eternally. It demanded that countries undertake reforms to government budgets, economic institutions & financial systems to ensure that the demand for the country's currency would increase *naturally* and the drain on the IMF's reserves would stop.

In our particular example of the US trying to maintain an overvalued exchange rate of 130 yen per dollar, what kind of conditions might these be? What we know is that there are effectively two ways to increase the demand for US dollars "naturally", i.e. via the trade balance (i.e. increase exports of US goods to Japan) or via the NFI (i.e. increase Japanese investment in the US). IMF's SAPs are usually tightly focused on encouraging export industries & foreign investment in a country.

The introduction of SAPs was a very controversial change in the IMF's lending practices. Many governments complained that these IMF lending conditions "infringed upon" the sovereignty and autonomy of national governments. Some of those conditions were not necessarily very wise either.

Structural adjustment policies cause a lot of political & economic problems. For instance, more export-orientation cause the traditional adjustment "costs" of specialization & trade. And, as we shall see later, trying to improve the NFI position often means that the country must loosen up foreign ownership rules or cut government budgets to inspire confidence in domestic assets (very painful to the people on government salaries, pensions, welfare, etc.), etc. Opponents often describe structural adjustment policies as "hitting the domestic poor" just to inspire confidence of rich foreign investors.

There are more effects. But we shall come to them a little later.

Finally, we should remember that the IMF still reserves the right to say "No" altogether to a loan request. It did so in the height of the Thai crisis in 1997 -- to a lot of criticism. Had the IMF acted swiftly then and saved the baht, it might have prevented the crisis there -- and prevented it from "infecting" Korea, Taiwan, Indonesia and elsewhere.

Its "no" during the Argentinian meltdown of 2001 is more debatable. While the pain to the average Argentinian has been enormous, many economists still think it was best to let Argentina's rather silly "**currency board**" (pegging exchange rate of the peso 1-to-1 with the US dollar -- an enormous over-valuation of the peso) collapse.

CAPITAL CONTROLS

Capital flight and speculative attacks are hard to counter. The central bank's official reserves to "fight it off" are limited. If the reserves run out, it must turn to the IMF for more. But, these days, the IMF usually ties its loans to lots of conditions which are very painful domestically.

Many countries, not liking either of these options, prefer to "stop" capital flight by simply forbidding it -- i.e. instituting laws that forbid (or make it very complicated) for foreign investors to sell domestic assets. These are known as **capital controls**.

Capital controls are very controversial. Firstly, they are seen as "undue infringement" on property rights. They will certainly discourage investors from investing in your country (worsening your Balance of Payments situation). And it can cause a lot of political problems. e.g. if a Japanese investor wants to sell US treasury bills but is forbidden from doing so by the US government, I am sure the Japanese government will protest and perhaps take retaliatory measures against US interests (e.g. block Japanese banks from lending to the US firms, etc.)

But some countries have used capital controls successfully. The most famous case is Malaysia. In the height of 1997-8 Asian crisis, the Malaysian governments instituted draconian capital controls and prevented a capital flight. Malaysia suffered a bit because of it -- but, on the whole, it might have suffered less than Thailand, Indonesia and Korea who didn't have them.

A more modest form of capital control is the **Tobin Tax**. Proposed back in 1971 by the economist James Tobin, the Tobin Tax is a mild tax of the sale of financial assets. The proposition is somewhere between 0.1 to 0.25 percent of volume traded (about 10 to 25 cents per hundred dollars).

The advantage of the Tobin Tax is that it is not too burdensome. Foreigners are not *forbidden* from selling their assets; it's just that that sale comes with a little price. Those that have good reasons to sell, will sell anyway. But that "little price" may be enough to convince many investors, when a capital flight begins, to stay put rather than just rush along with the rest of the herd. In other words, a little tax may be enough to bring some sanity into mass hysteria. Capital flight will thus be limited to a little trickling out, not a massive flood-wave outwards.

That are many pros & cons to such a scheme. The principal advantage of the Tobin Tax is that it makes the jobs of Central Banks easier. No longer would they have to drain their reserves in a hopeless quest to defend the currency or, when that fails, go begging hat-in-hand to the IMF, before the inevitable meltdown.

The main disadvantage is that perhaps it may make the problem worse and let countries maintain overvalued exchange rates for very long time -- storing up more trouble for later.

CURRENCY BOARDS

A currency board is an independent board that ensures a fixed exchange rate. Three of the most famous cases of currency boards are:

-- Hong Kong adopted a currency board early on and has maintained a fixed parity of HK$ 7.8 to the US dollar since 1983.

-- Bosnia & Herzegovina adopted a currency board in 1997, offering a fixed parity of 1 Convertible Marka: 1 Deutschemark (now 0.51 Euro).

-- Argentina adopted a currency board 1991, offering a 1:1 parity between the Argentinian peso and the US dollar. It abandoned the board in 2002.

The working of the currency board is not mysterious. Effectively, the country is still releasing reserves/printing money to maintain a fixed exchange rate. But control over the releasing/printing is no longer in the hands of the Central Bank, but in the hands of an independent currency board who is charged with maintaining this parity.

Currency boards *separate* internal from external concerns. The currency board's *only* concern is to keep exchange rate stability at a fixed rate. It does not take into consideration *any* domestic objectives. So if it has to print or destroy money to keep the exchange rate fixed in a way that worsens unemployment, then so be it.

The Gold Standard

An even more famous case of a "currency board" is the "**Gold Standard**", adopted by most countries in the 19th & early 20th Century. In the Gold Standard, countries limited their printing of money to the amount of gold held in their vaults, keeping an "official" exchange rate of domestic currency for gold. If the amount of gold reserves declined, then less money was printed. If the amount of gold increased, then more money was printed.

The Gold Standard was very unpopular. In the US, in the late 19th Century, there was a strong political movement calling for the adoption of **Bimetallism** or a "Gold-and-Silver standard", that would allow more money printing than the gold standard alone.

The Gold Standard collapsed in the 1930s during the Great Depression when, in an effort to boost their economies and stop deflation, governments let the printing presses roll. The Bretton Woods arrangement of 1944 replaced the defunct gold standard with the dollar standard (with a little gold footnote attached).

Argentina's Crisis

Argentina's experiment with the currency board started off on a good footing, but ended up in disaster. In 1989, Argentina was suffering negative (-6.2%) growth and had an inflation

rate of 3000%. Adopting the currency board was an attempt to bring this to heel (how? we'll see how later) and inspire confidence in foreign investors.

It worked at first. Growth recovered and inflation climbed down to a "modest" 20% or so.

But in 1999, Brazil suffered a capital flight, prompting the Brazilian real to depreciate relative to the dollar. But Argentina stuck to its currency board.

Now, Brazil exports very similar products as Argentina so, as the Argentinian peso continued fixed to the dollar, that meant that foreigners preferred to buy Brazilian rather than Argentinian goods. Demand for the peso collapsed, creating a balance of payments deficit for Argentina that forced the Argentinian currency board to release more dollar reserves & withdraw pesos to keep it at the 1:1 rate.

Then foreign investors got jittery in 2001 and, thinking that the government might default on its dollar-denominated debt, began disinvesting. A capital flight ensued, putting even more pressure on the board. Needing all the dollars it could get, the Argentinian government closed down the banks and forbade Argentinians from withdrawing more than a small amount of dollars from their bank accounts and then forbade all withdrawals altogether -- prompting the now familiar scenes of Buenos Aires housewives banging on the bank doors with hammers & pots.

Argentina's applications for extra reserves with the IMF were given the cold shoulder. The 1:1 exchange rate, it declared, was unfeasible. It must abandon its currency board and allow the peso to devalue. The currency board was abandoned in February 2002.

The economic effects of the devaluation were devastating, sending the economy through a serious contraction. GDP fell by 14.7% while unemployment rose to 21.5% in 2002.

CURRENCY UNIONS

The most drastic way for a country to avoid exchange rate volatility and capital flight is to do without a domestic currency altogether. There are three major currency unions in the world today: the CFA zone, the Euro zone and the East Caribbean zone.

(1) CFA Zone

The CFA franc is the common currency of fourteen African nations, divided into two zones (and two Central Banks):

(a) UMOA/WAEMU (West African Monetary Union) composed of Benin, Burkina Faso, Cote d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal and Togo. This zone is overseen by the Banque Central des Etats de l'Afrique de l'Ouest (BCEAO), based in Dakar, Senegal.

(b) CEMAC (Central Africa Economic and Monetary Community) composed of Cameroon, Central African Republic, Chad, Congo (Brazzaville), Equatorial Guinea and Gabon. This zone is overseen by the Banque des Etats de l'Afrique Centrale (BEAC), based in Yaoundé, Cameroon.

Its acronyms have gone through many mutations. "CFA" originally meant Colonies Françaises d'Afrique, morphing into Communauté Française d'Afrique. It now means two things: in West Africa, it means Communauté Financière d'Afrique, while in Central Africa, it refers to the Coopération Financère Africaine.

The CFA francs issued by the respective banks are only legal tender *within* their respective regions, but both banks maintain the same peg relative to the French Franc and, up until a financial crisis in the summer of 1993, CFA francs enjoyed free & unlimited convertibility between the two zones.

Since its inception, the CFA franc has been pegged to the French franc, its convertibility guaranteed by the French treasury and traded in the Paris currency markets. It has gone only through two large devaluations, in 1958 (from 2 CFA:1 FrF to 50 CFA: 1 FrF) and in 1994 (from the previous peg to 100 CFA: 1 FrF).

Since the demise of the French Franc in 1999, the CFA Franc is now pegged to Euro (666 CFA: 1 Euro) and its convertibility continues to be guaranteed by the French treasury.

(2) Euro Zone

The European Union (originally, European Economic Community) was founded in 1958, and now has fifteen member countries, with several more already accepted for future admission. After the Bretton Woods agreement broke down in 1973, the currencies of these nations floated rather freely until 1979, when the European Monetary System (EMS) was adopted, whereby the European currencies were pegged to an abstract currency unit known

as the ECU ("European Currency Unit"), which represented a basket of underlying currencies (dominated by the German currency, the Deutsche Mark). Although European currencies were pegged to the ECU, the ECU itself floated against the US dollar and other foreign currencies.

The pegging to the ECU wasn't a solid peg. European Central Banks were allowed to permit their currencies to float in a narrow band of ±2.25% around their central ECU exchange rates. This Exchange Rate Mechanism (ERM), as it was known, worked well enough until 1992, when George Soros launched a speculative attack on the British pound in 1992, sending the Deutsche Mark flying high above its upper bound and the pound sterling plummeting far below its lower. The ERM was revamped in 1993, giving Central Banks a wider band of ± 15%.

But this was temporary anyway. By the February 1992 Treaty of Maastricht, the European Union agreed on a plan to eventually adopt a single currency, transforming the ECU into an actual, solid, common currency.

In order to "align" the economies prior to adoption, the members of the European Union had to meet certain criteria on national budget & debt, outlined in the controversial "**Stability Pact**" set out in Maastricht. The Stability Pact requires that Euro-zone governments cannot have budget deficits exceeding 3% of GDP or accumulated government debt exceeding 60% of GDP. In the late 1990s, the EU countries undertook massive painful government reforms (and a lot of accounting shenanigans) in order to meet the Maastricht criterion.

In 1998, a European Central Bank (ECB) (based in Frankfurt, Germany) was created, taking over the principal functions of the Central Banks of the individual countries that were about to join the common currency. The once formidable Bundesbank, Banque de France, Banca d'Italia, etc. were reduced to branches of the ECB.

In January 1999, the common currency (now called the "Euro") was formally adopted by eleven members of the European Union (Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxemburg, Netherlands, Portugal and Spain). The twelfth, Greece, joined in soon after. Euro notes & coins began being substituted for national currencies in 2002.

In the late 2000s, a few more of the "new generation" of EU members joined the euro: Slovenia in 2007, Cyprus and Malta in 2008, Slovakia in 2009 and Estonia in 2011, bringing the total Eurozone membership to 17.

As of this date, several big EU members (UK, Sweden, Denmark) remain outside the Euro-zone. Denmark (like many other European countries aspiring to membership) have kept their currencies pegged to the Euro in the revamped ERM (what's called ERM II). Britain & Sweden have not formally joined ERM II, but keep their own targets *vis-a-vis* the Euro. The Euro continues to float freely against foreign currencies like the US dollar and the Japanese yen.

(3) **East Caribbean Zone**

East Caribbean zone, formed in 1983, uses the East Caribbean dollar, managed by the East Caribbean Central Bank (ECCB). It is the common currency of Anguilla, Antigua & Barbuda, Dominca, Grenada, Monserrat, St. Kitts-Nevis, St. Lucia and St. Vincent & Grenadines.

(4) **Ecuador's Dollarization**

Facing similar problems, Ecuador went one step further than Argentina and adopted the dollar wholesale -- a unilateral monetary union with the United States.

In 1997-8, the devastation of the El Nino & the depressed oil market hit Ecuador's economy badly and the Ecuadorian sucre went into a free-fall in 1999, losing nearly 70% of its value. In early 2000 a state of emergency was declared and a plan introduced to dollarize the Ecuadorian economy. Ecuador adopted the US dollar as sole legal tender in September 2000.

Summary

Currency unions eliminate exchange rate volatility and the risk of capital flight, but it comes at the cost of losing control over the power to print & withdraw money to achieve domestic objectives.

In most monetary unions, governments can still try to conduct monetary policy. European governments can make their domestic interests heard at the ECB and west and central African countries still have voice in Dakar and Yaounde. The same with the East Caribbean countries. So, Europeans, Africans & West Indians have only *partially* surrendered control over monetary policy. They can still say something, however diluted.

But in the case of Ecuador, Quito has no voice in the US Federal Reserve. Ecuador has given up its monetary policy entirely -- at least until it decides to reverse the dollarization and start printing sucres again. It is a novel experiment.

The crisis in the PIGS (Portugal, Ireland, Greece, Spain) that emerged in the aftermath of the Crisis of 2008, and has accelerated through 2010-12, illustrates one of the major problems of the a currency union: namely, the inability of domestic governments to use the monetary policy or exchange rate policy as a tool of domestic macroeconomic objectives, and has prompted much talk about reviewing the foundations of the Eurozone and even the EU.

BEGGAR THY NEIGHBOUR

We have mentioned that exchange rates pegging can be used for domestic objectives. While we shall cover this in more detail later, a word is necessary here.

We have seen that if a government devalues a currency, exports will rise and imports will fall. Domestically, more exports mean more demand for your goods - so more output of your industry, more employment for your workers. So many governments trying to fix employment problems are often tempted to devalue.

The problem is the exchange rates are always relative to another country. When a government devalues its own currency, it is simultaneously *revaluing* the currency of another country. So while devaluation *helps* your industries, it *hurts* the industries of other countries. It is for this reason that deliberate devaluations are sometimes called a "**Beggar thy Neighbour**" strategy: your employment grows *at the expense* of the employment in another country. It is a "zero-sum" game. In order for you to win, the other has to lose. You can't both win the devaluation game.

This has been a big issue in the 2000s, particular as the People's Republic of China has been suspected of running a "Beggar Thy Neighbor" strategy to improve domestic growth and employment, i.e. the Chinese government has been accused of deliberately *devaluing* the yuan (and thus revaluing the US dollar). In other words, the growth of output and employment in China has been driven by a currency manipulation that has caused unemployment and deindustrialization in the US.

Now, this is not merely a case of nationalism, of pride and sour grapes. There is an economic efficiency element to it. Because "Beggar they Neighbour" devaluation is *de facto* identical to **protectionism**, that is, identical to imposing tariffs and introducing export subsidies, and not allowing comparative advantage and all the efficiency benefits of trade to take place.

The reason why should be clear. Remember that with free trade, there should be a uniform price of goods across countries. If, allowing free trade, a Chinese computer sells for ¥3000 in China, and an American computer sells for $1,000 in the United States, we can assume they have the same real price. In other words, the implied exchange rate *should* be ¥3 = $1. (see appendix on Purchasing Power Parity (PPP)). That is the exchange rate which makes the uniform price in both countries.

But suppose the exchange rate quoted on the market is ¥6 = $1. That means that to a Chinese consumer, the American computer costs ¥6000, that is, twice the price of a domestically-made Chinese computer. Assuming no qualitative difference in the computers, this is equivalent to a **tariff** on the importation of American computers into China. The inefficiency effects of this are no different than if the Chinese government slapped a tariff explicitly.

Conversely, to an American consumer, a Chinese computer costs only $500, which is half the price of an American computer. This is effectively an **export subsidy**.

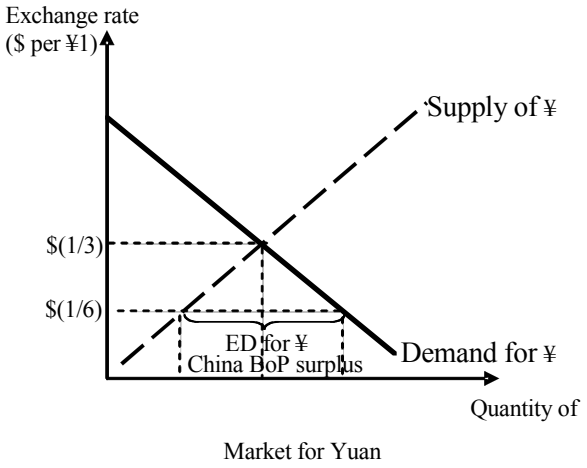
(Remember with an export subsidy you should see the phenomenon of **dumping**, that is the price you sell abroad is higher than the price at home. If the domestic price of Chinese computer is the same as a US computer (as free trade implies), then it is selling computers in the US lower than it is selling them in China.)

Now, you can bring up complaints that, well, China is a poorer country, with cheaper labor, and maybe the difference in price just reflects different costs of production. Certainly a lot American workers think that, and imagine that is the reason for the Chinese edge is precisely because it is cheaper costs, and lobby to exclude them because they don't have the same kind of "labor standards" and "fair wages" that American workers enjoy.

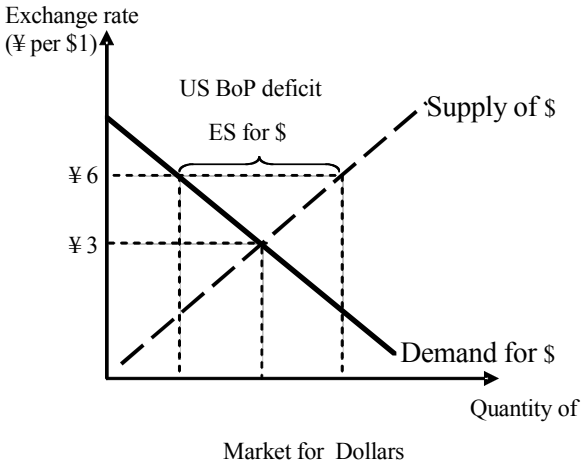
But that can't be. Or rather, that could be if China and the US weren't trading with each other. In that case, the "domestic price" in China probably would be lower than the US domestic price. But they are trading with each other. And you know that *with trade*, you necessarily end up with a uniform real price for goods across all countries - prices for computers should rise in China, and prices of computers should fall in the US until they're equal to each other.

But they *aren't* equal. At an exchange rate of ¥6 = $1, American computers have twice the price of Chinese computers. Such a price difference only arises only if there are tariffs or export subsidies in place, not free trade.

The real exchange rate that should emerge if trade was free would be ¥3 = $1. So if it is ¥6 = $1, that means yuan is **undervalued** (i.e. below equilibrium in the yuan market) and conversely the dollar is **overvalued** (i.e. above equilibrium in the dollar market.)



Market for Yuan (China BoP position)



Market for Dollars (US BoP position)

In short, the equilibrium is ¥3 = $1. So if the actual exchange rate is ¥6 = $1, the Chinese government must be deliberately devaluing the yuan and (reciprocally) revaluing the dollar. It is running a "beggar thy neighbor" strategy.

What can the US do about it? Not much. If the Yuan is undervalued, that necessarily means there is an excess demand for yuan (and an exess supply of dollars). Maintaining that exchange rate is very easy for the Chinese government: all it has to do is print yuan and soak up dollars. And China can theoretically keep doing that forever. It isn't "constrained" on how of it's own currency it can print. China isn't going to run out of paper & ink.

What does it do with these dollars? Stick them in reserves. The Chinese central bank is currently (2010-11) estimated to hold something like $3 *trillion* dollars as cash in its reserves. You don't build up a $3 trillion dollar reserves in a few years unless you're undervaluing.

Of course, sticking those dollars as cash in a big vault at the Bank of China doesn't earn interest. So the Chinese government actually has a sovereign wealth fund - several in fact - dedicated to finding assets to buy with some of their dollar reserves and earn a little interest. It has taking to buying a *lot* of US Treasury bonds on bond market. That is Chinese government funds hold a large chunk of US government debt.

Newspapers sometimes interpret this news with stories of alarmism - e.g. that the Chinese government is doing the US government a *favor* by holding so much Treasury bonds, and that if the US government doesn't behave nicely, the Chinese government might "dump" its giant load of dollar reserves and Treasury bonds on the market.

But the US government would like nothing better than that. If China dumps the dollar reserves, it is surrendering the peg - the value of the dollar will depreciate and the value of the yuan will appreciate. The competitive position of US industries improve - US exports will rise, and American imports of Chinese goods will fall, the US will improve its domestic growth and employment situation. But *China*'s position will be hurt - as it will now export less to the US. And Chinese government policy has been focused on creating export-oriented industries, to create jobs, and drain the Chinese peasantry out of the countryside and into city industry. Many (all?) of these recent gains would be set into reverse.

As a growth strategy, Chinese devaluation has proved brilliant for China. It has improved domestic growth & employment in China dramatically, transforming a large, poor, overcrowded agricultural nation into an industrializing country - a huge feat at this scale.

But this "beggar thy neighbour" strategy has come at great cost to the US. Well, not to US consumers (they've gotten a lot of cheap imported goods, export-subsidized by Chinese government - US consumers should write China a thank you note.) The cost has been to American industry and American jobs. China has industrialized *by* deindustrializing the US. The manufacturing base has been eroded, American workers have been laid off steadily and wages have stagnated as a result.

But isn't this how trade works? Not quite. Trade works by comparative advantage, competition, and the cheaper producer should indeed take the larger market share. But a "weak yuan" devaluation policy isn't regular competition. It is *government* interference in a market, it is protectionism - as we shown, it is identical as if Chinese government imposed tariffs on US imports and introduced export subsidies to Chinese exporters to the US.

Of course, if it had done so *explicitly*, then it would be violating the rules of the WTO. So it does so by exchange rate devaluation. The WTO doesn't have jurisdiction over exchange rates, only over explicit tariffs, quotas and export subsidies. So the WTO can't do anything about exchange rate policy.

Technically, exchange rates are the purview of the IMF. But since the breakdown of the Bretton Woods system, the IMF has not had any "rules" about exchange rates.

(It used to - indeed, one of the original reasons the IMF came to existence in 1945, is precisely because during the 1920s & esp. 1930s, countries were engaged in a tit-for-tat spirals of competitive devaluations - all countries were trying to "beggar thy neighbor", particularly during the Great Depression. Introducing fixed exchange rates across all countries, overseen by the IMF, was in great part to put an end to that kind of chicanery. But the IMF doesn't have that power anymore.)

So it boils down the US government doing something by itself. But what can the US government do? If it "retaliates" by imposing tariffs & quotas on Chinese imports, then the US will be in violation of the WTO treaty There is no legal provision for "retaliating" against exchange rate pegging.

Remember, China maintains an undervalued yuan by printing. The US government can't "stop" China from printing its own currency. It can ask. It can plead. It can bring China into big G20 meetings and hopefully talk enough brotherhood and solidarity in an effort to get the Chinese government to quit undervaluing "for the sake of all". But the strategy has worked well for Chinese growth thus far, there are still a ton of peasants wallowing in the Chinese countryside that need jobs, so there's still some way to go before the government feels it has done "enough".

So the US government has done the only thing it can do: counteract with its own massive printing of dollars and hope that will drive the dollar down. Of course, the more dollars the US prints and throws on the market, the more yuan the Chinese must print to suck those dollars out and keep the yuan undervalued.

This is the great Achilles heel. to the "beggar thy neighbor" strategy: the danger of high inflation. US government printing won't cause inflation, because Chinese are sucking dollars out of the market as fast as the US government can print them and locking them in a box. But nobody is sucking yuan out (and China doesn't want them to be sucked out, they want yuan to stay undervalued). But that means there is a heck of a lot of yuan are floating around. And the more the US prints, the more China *has to* print to keep the peg. There is a

race going on. And the end result of this race may be inflation, or even, if the race accelerates quickly, hyperinflation, in China.

Inflation is a real worry to the Chinese government. So it has, in recent years, also done its own "jaw-jaw" at G20 meetings, trying to persuade the US to "stop printing" (so that it itself doesn't have to print). Of course, the US would be glad to stop printing, if China promises to stop undervaluing. But that is not something China is prepared to agree to.

Who will be the first to blink is an open question. Time seems to be on the US side - inflation is already raising its ugly head in China. If inflation accelerates, China will have little choice but to quit the peg.

Finally, keep in mind another thing: the weak yuan means effective tariffs on foreign imports and export subsidies, which are being "paid for" by Chinese consumers. That is, standards of living are artificially being kept low, Chinese consumers are being deprived of cheap foreign goods they might want to buy. The government has made an implicit "deal" with its own population: you give up foreign imports for a spell, keep your standards of living suppressed, so that we can keep creating new jobs. That has worked fine so far. But the patience of Chinese consumers may also start wearing thin (particularly if accompanied by inflation). At some point, the rising Chinese middle classes will begin believing they are entitled to exercise their purchasing power, and demand the government drop the peg and give Chinese consumers access to foreign imports at cheaper world prices. Of course, China is, to put it mildly, a police state, so it is a little difficult for the average Chinese consumer to make himself heard. But the Chinese government is aware it cannot suppress consumer aspirations forever.

Ideally, the Chinese government can keep inflation and consumer aspirations under the boil until it has industrialized "enough" so that it can start depending on its own domestic consumer market (rather than exports to the US) to constitute the major demand for its own industries. At that point, when it is no longer reliant on American consumer demand for its industry, it may let choose to drop the undervaluation policy and let markets move naturally again.

Small addendum: the J-Curve Effect

Do devaluations always increase exports and decrease imports? Well not always immediately. Export industries may need time to adjust before they can meet higher foreign demand. Moreover, consumer behavior may also take time to adjust. If an American consumer is used to buying a certain French wine, a devaluation of the dollar may actually prompt him to spend *more* money to keep buying the same French wine he was buying before. So he might spend *more* money imports for a while, before he realizes he can switch to California wine. So devaluations might temporarily see exports not budge and even see imports rise temporarily, before the real effect kicks in and exports rise and imports fall. This is called "**J-curve effect**" because, well, because of the way the letter "J" is shaped: it goes down a little first before it goes up a lot. Similar to the trade balance in response to a devaluation.

APPENDIX I: THE OFFICAL PICTURE

We have asserted the basic formula that:

Balance of Payments = Trade Balance + Net Foreign Investment

That was enough for our purposes. But in many textbooks & in statistical handbooks, however, there is a more precise (and slightly different) meaning attached to the term "Balance of Payments". In particular they use the formula:

Balance of Payments = Current Account + Capital Account + Official Reserve Account

What is the "Current Account"?

Current Account = trade balance + net unilateral transfers + net investment income.

where:

Trade Balance = Exports minus imports of goods and services (as we said)

Net Unilateral Transfers = Grants by foreigners to domestic citizens where no goods & services are "exchanged" (e.g. foreign aid, receipts by migrants abroad to their families here, pension payments to foreign retirees on our beaches). Of course, as it is net, we are subtracting cash payments by domestic citizens to foreigners.

Net Investment Income = Profit, dividend and interest income that domestic companies receive from their assets abroad that are repatriated back home. Being "net", we subtract profits, dividend & interest payments on domestic assets that are sent abroad to foreign owners.

Capital Account is net foreign investment (NFI), or purchase of domestic assets by foreigners minus purchase of foreign assets by citizens. (note: we exclude asset transactions between foreign & domestic Central Banks).

Official Reserve Account: this is the net asset transactions between domestic & foreign central banks. (e.g. purchases of US dollars, US gold & US-held SDRs by foreign Central Banks minus purchases by the US Federal reserve of foreign currencies, foreign gold and foreign-held SDRs.)

Technically, by this formula, the Balance of Payments *can never be zero*, because of the double-entry book-keeping nature of this definition. A credit in one account is matched perfectly by a debit in another, e.g. every purchase of a foreign good (a debit in the Current Account, as a good is imported) is paid for by giving the foreign firm cash or a bank check (a credit in the Capital Account, as the foreign "ownership" of domestic assets (cash/deposits) has increased).

But remember that we asserted there *can* be Balance of Payments "deficits & surpluses". What we meant is there can be deficits & surpluses when we *add up* Current Account & Capital Account. The issue is we ignored Official Reserve Accounts, where the surplus-deficit of the other two is recorded as a debit-credit.

So, *technically*, the official Balance of Payments is *always* zero. But, in common parlance, we say Balance of Payments is in surplus when Current Account + Capital Account > 0 and we say Balance of Payments is in deficit, when Current Account + Capital Account < 0.

Appendix II: the PPP Story

In the press, we often hear about how some currency is "overvalued" or "undervalued" relative to another. What does this mean? If exchange rates are, as we have said, determined by demand and supply on the currency markets (with exporters, investors & governments participating), then what does the writer or commentator mean?

It just means that the writer *thinks* that the exchange rate *should* be different from the actual exchange rate on the market. Furthermore, he thinks that, in the *long-run*, the actual exchange rate will tend towards and even settle at the "correct" rate.

But what is this "long-run" exchange rate? Everybody has a different answer for that. Indeed, professional currency speculators make their living by forming an estimate of what the long-run exchange rate is and then betting that the actual exchange rate will move in that direction (and, in doing so, they are betting against *other* speculators who think it will move in the opposite direction).

There is no clear "science" behind this. Everyone has their hunch.

Some people use the **purchasing power parity (PPP)** theory to estimate the long-run exchange rate. The PPP exchange rate is a very popular one. It stems from our very first model when we said that exchange rates adjust to clear the trade balance (i.e. before we introduced NFI). Remember that in that model, when exchange rates were "off", then the prices of goods across countries were different. When they are in equilibrium, then the prices of goods are the same.

Purchasing Power Parity: the theory that, in the long-run, exchange rates will settle where prices of goods are the same across countries.

Remember that in our earlier example, when the exchange rate was ¥150 yen per dollar, the price of Japanese computers was ¥140,000 while the price of American computers (to Japanese consumers) was now ¥150,000. The prices are different. We noted how that implied that Japanese consumers would decrease their imports of US goods while Americans would increase imports of Japanese goods, etc.

At ¥140 yen per dollar, the price of American computers and Japanese computers was the same (¥140,00 each) (and, indeed, it was the case for the three other goods as well). So, 140 yen per dollar is the *PPP exchange rate*.

In practice, economists and currency dealers calculate PPP exchange rates by examining the price levels for the same basket of goods between two countries and *deducing* the PPP exchange rate from that. The simple formula is:

PPP exchange rate = (prices of goods in Japan)/(prices of goods in US)

The problem, of course, is that the typical "basket" of goods consumer by Japanese consumers & American consumers can be quite different. And it doesn't take into account price differences because of transportation costs, taxes, the fact that some goods aren't traded at all, etc. It is just a rough-and-ready way of calculating where the actual exchange rate might be tending towards.

In a light-hearted attempt to illustrate this, *The Economist* magazine has calculated PPP rates from a rather limited basket. It is composed of one good only: the "Big Mac" hamburger from the McDonalds' restaurant franchise.

The Economist's **"Big Mac" index** was given out in class. Reading the top line, they give the price of the Big Mac in the US ($2.71) and then compare it to prices of Big Macs in other countries. e.g. in Argentina, the Big Mac costs 4.10 pesos. So, the PPP exchange rate is calculated as follows:

PPP exchange rate = (price of Big Mac in Argentina)/(price of Big Mac in US)

or:

(4.10 pesos)/($2.71) = 1.51 pesos per dollar.

So, by the PPP doctrine, the long-run value of the Argentinian peso should be 1.51 per US $.

Of course, the actual exchange rate, as quoted on the currency markets, is different -- it is 2.88 pesos per dollar. So, comparing that to the PPP rate of 1.51, that means that currently, the US dollar is *overvalued* relative to the peso or, conversely, the peso is *undervalued* relative to the dollar (by a magnitude of 45%). By the PPP doctrine, we should *expect* the value of the peso to appreciate (or dollar to depreciate) in the long-run.

Of course, serious currency dealers use a much broader basket of goods to calculate PPP, but the principles are the same. Quite surprisingly, the Big Mac index has been tested and proven to be quite accurate in predicting exchange rate movements!

The biggest drawback of the PPP doctrine, of course, is that it implicitly assumes that people demand currency only to buy goods (import/export). It completely ignores the fact that investors need currency to buy *assets*. So, the PPP doctrine *completely ignores* the important role of the NFI in determining exchange rates. Even though (as we said before) NFI is a much larger component of currency demand than trade in goods.

Despite all its drawbacks, the PPP theory has nonetheless proved surprisingly accurate in predicting exchange rate movements over the long run -- and thus deserves an honorable mention.

SUMMARY

Currency Markets

-- Exchange rates are determined in the currency markets by the demand and supply for currencies.

-- Demand for US dollars is derived from the amount of US exports abroad + the amount of foreign investment in the US. (plus US disinvestment abroad)

-- Supply of US dollars is derived from the amount of US imports from abroad + the amount of US investment abroad. (plus foreign disivinvestment in the US)

-- By the Law of Markets, if there is an excess demand for dollars, the dollar will appreciate in value (exchange rate rises); if there is an excess supply of dollars, the dollar will depreciate in value (exchange rate falls).

Balance of Payments

There is a direct connection between the currency markets and the balance of payments of a country.

-- The Balance of Payments = Trade Balance + Net Foreign Investment.

-- Trade Balance = Exports minus imports.

-- Net Foreign Investment = investment by foreigners in your country minus investment by your countrymen abroad.

-- If the US Balance of Payments is in a surplus = excess demand for dollars.

-- If the US Balance of Payments is in a deficit = excess supply of dollars.

-- So, we can see in which direction an exchange rate must move by looking at the Balance of Payments of a country.

-- The Balance of Payments is *not* the same thing as the Trade Balance. A country can have a zero balance of payments even if it runs a trade deficit (it just needs that NFI be in surplus by the exact same amount).

- A boom in resources (or similar event) that causes a sudden large influx of foreign currency can raise exchange rates sharply and have a deleterious effect on other domestic industries. ("Dutch Disease").

Capital Flight

-- Capital Flight, a sudden mass disinvestment by foreigners, can cause exchange rates to collapse steeply.

-- The root cause of capital flight are various and not always rational.

-- Whatever the original cause, "herd behavior" by foreign investors can turn a mild amount of disinvestment into a fully-fledged capital flight.

-- For some reason not very well-understood, capital flights are quite contagious. A capital flight from one country often prompts capital flights from other unrelated (but "similar-looking") countries.

Speculation

-- A lot of the daily movements of the exchange rate come because the NFI moves around a lot.

-- A lot of NFI comes from speculators betting on exchange rate movements by buying/selling assets continuously throughout the day.

-- Usually, speculation is not a problem because the amount of people betting an exchange rate will go up is more or less matched by people betting it will go down.

-- Speculation *can* be stabilizing if the source of exchange rate volatility arises from elsewhere (i.e. from fluctuating demand for imports/exports)

-- But if *a* lot of speculators bet in one direction while hardly anybody bets in the opposite, speculation can cause quiet sharp shifts in exchange rates. Its effect is similar to a capital flight.

-- A "speculative attack" on a currency refers to a deliberate and concerted attempt by some traders with very large resources to force an exchange rate movement.

Government Intervention

Governments (Central Banks) intervene in currency markets in order to:

(1) Stabilize exchange rates around the long-run mean.
(2) Fight back against capital flight
(3) Meet domestic objectives like employment & inflation.

-- Internal objectives (employment) and external objectives (exchange rate stability) often conflict with each other, so sometimes governments keep the exchange rate artificially low/high.

-- They can maintain exchange rate stable in the case of a balance of payments surplus (excess demand for currency) by printing money.

-- They can maintain exchange rate stable in the case of a balance of payments deficit (excess supply of currency) by releasing official reserves.

-- But if the B of P deficit is persistent, they may run out of official reserves and have only a few options left:

(a) allow the currency to depreciate.
(b) convince foreign central banks to print more currency (policy coordination)
(c) Install capital controls to discourage or stop disinvestment.
(d) Borrow more reserves from the IMF

-- IMF now provides stringent conditions for lending in order to prevent countries using them to maintain artificially high/low exchange rates.

-- Governments who try to maintain artificially high/low exchange rates are very susceptible to a speculative attack.

-- Currency Boards use monetary policy *solely* to meet external objectives.

-- In Currency Unions, countries get external stability, but lose the power to use monetary policy to meet domestic objectives.

- Governments sometimes use devaluation as a means of promoting growth of domestic industry and domestic employment. But it comes at the expense of reducing the growth and employment in another country. ("Beggar thy Neighbor")

PPP

-- Purchasing power parity theory is a theory about where the exchange rate is bound to be (or tend towards) in the long-run.

-- PPP exchange rates are calculated by assuming that goods have the same price across countries and then deducing the implied exchange rate from the price ratio.