

# 20

## Exchange-Rate Regimes

**Tools:** Central bank balance sheet.

**Key Words:** convertibility; capital mobility; capital controls; fixed and flexible exchange rates; foreign exchange reserves; sterilization.

**Big Ideas:**

- Countries adopt different exchange rate regimes: fixed, floating, and in between.
- The trilemma limits our policy options: we can choose only two of (i) fixed exchange rate, (ii) free flow of capital, and (iii) discretionary monetary policy.
- Fixed exchange-rate regimes must be defended through open market operations and are vulnerable to speculative attack.

---

The term “exchange-rate regimes” refers to the various arrangements that governments around the world make about international transactions. We’ll see (i) how central banks intervene in currency markets to fix the price and (ii) how such fixed exchange-rate systems sometimes blow up.

### 20.1 A catalog of foreign-exchange arrangements

Governments follow a wide range of policies toward their currencies. One aspect of policy is whether people and businesses can freely exchange their local currency for another: whether the currency is *convertible*. The US dollar, for example, is convertible. You can walk into most banks in New

York and use dollars to buy dozens of foreign currencies. Or you can use your credit card abroad and have the currency transaction done for you. The renminbi, however, has limited convertibility. You need approval from the Chinese central bank to buy or sell Chinese currency.

A related issue is *capital controls*: whether the government restricts movements of capital (funds) in and out of the country. In the US, capital is generally free to move in and out of the country, although there are restrictions on foreign ownership of companies in some industries (banks, media, airlines). In China, there are limits on foreign investments that vary (as in the US) by industry and type (direct investment is easier than buying securities). And there are restrictions that limit the amount of money that Chinese citizens can take out of the country. These controls are typically enforced through convertibility: since you can't convert renminbi to (say) dollars, you can't take it out of the country.

There's nothing unusual about this. Many countries limit convertibility and capital flows, particularly during times of stress. Malaysia imposed capital controls during the Asian crisis of 1997, and Argentina did the same in 2002.

Another aspect of foreign-exchange policy is whether the price of the currency is set by the government, allowed to float freely, or something in between. If the price is determined in a free market, we say that we have a *flexible* or *floating* exchange-rate regime. If the government sets the price, we say it has a *fixed* or *pegged* exchange-rate regime. A *managed float* is somewhere in between.

## 20.2 Fixed exchange rates

Many countries have fixed exchange-rate regimes of one sort or other. Ecuador uses US dollars, so its currency is fixed by design. The countries of the European Monetary Union use a common currency, the euro. Other countries have their own currencies, but intervene to fix the price. Probably the most prominent current example is the Chinese renminbi, which has been quasi-fixed for more than a decade.

How does a central bank set the exchange rate if the currency is convertible? Can it simply announce a rate? Probably not. You can state a price, but you can't make people trade at it. You could claim, for example, that your apartment is worth \$10m, but if no one is willing to buy it for that price, the statement is meaningless. For the same reason, a central bank must back up its claim to fix the exchange rate by buying and selling as much foreign currency as people want at the stated price.

Let's think through how this might work. Suppose the New York City government decided to fix the price of beer at \$2 a six pack (cheap even if you live outside NYC). It supports this price by buying or selling any amount at the quoted price. Can they keep the price this low? Our guess is that at this price, beer makers would not find it profitable to make any (at least not any that we'd be willing to call beer). People would then flood the government with requests for beer, which the government would not be able to meet. When the government reneged on its promise to buy or sell at \$2, the price would rise above \$2 to its market level, either officially or on the black market. Unless the government has enough beer to back up the price, the system will collapse. Alternatively, suppose that the government set the price at \$20. Beer makers would flood the government with beer at this price, leaving the government with a huge surplus. This is roughly what Europeans do with agriculture, where artificially high prices have left the EU with "mountains of butter," "lakes of wine," and so on. The point is that the government can fix a price only if it is willing and able to buy and sell at that price — or outlaws market transactions altogether.

The same logic applies to currencies. If the People's Bank of China were to support an excessively high price for the renminbi, then it would be flooded with offers from traders selling renminbi for (say) dollars. Its balance sheet would look something like this:

Assets		Liabilities	
FX Reserves	20	Money	200
bonds	180		

We made these numbers up, but they give us the right idea. The central bank has the usual liabilities, "money" and government bonds, and also holds some foreign currency reserves, which you might think of as dollars. The PBOC intervenes in the currency market by trading renminbi for dollars, and vice versa, depending on market conditions.

Suppose, for example, that Nike wanted to convert \$2m to renminbi to build a new plant in China. It would do this through a Chinese bank. If the bank had no countervailing trades, it would go to the PBOC and exchange the \$2m for renminbi at the going rate — say ten yuan per dollar, to make the arithmetic simple. The PBOC's balance sheet would then show an increase of 20m yuan worth of foreign currency and a comparable increase in its monetary base:

Assets		Liabilities	
FX Reserves	40	Money	220
bonds	180		

Note that the transaction doesn't make the PBOC any richer. Its net worth is unchanged, since it has exchanged assets with equal value.

The difference, then, between fixed and flexible exchange-rate regimes is that the former obligates the central bank to buy and sell currencies at the stated price.

20.3 Sterilization

You might have noticed that when a central bank buys and sells foreign currency, its money supply changes. In the example above, the purchase of 20 worth of foreign currency increased the money supply by the same amount. It's automatic: when the central bank purchases foreign currency, it offers domestic currency in return.

Central banks often want to reverse this impact of foreign exchange intervention by engaging in an offsetting open market operation. We refer to this as *sterilization*.

In our example, the central bank would like to reduce the money supply by 20, offsetting the impact of buying foreign currency. It does so with an open market sale of government bonds. The sale of bonds is paid for in local currency, which is now held by the central bank . Its balance sheet is now

Assets		Liabilities	
FX Reserves	40	Money	200
bonds	160		

In China's case, this has happened to such an extent that the bond position is negative: the PBOC is an issuer of bonds, not an investor.

20.4 The trilemma

Exchange-rate policy is, evidently, a dimension of monetary policy since it involves management of the central bank's balance sheet. Is it another tool a central bank can use to manage the economy?

Both logic and experience tell us that the central bank's choices are limited. The sharpest example is the *trilemma*. You can choose, at most, two of the following:

- fixed exchange rate
- free international flow of capital
- discretionary monetary policy

If you try for all three, something will give, probably the exchange rate.

The US lets the exchange rate float, which allows it to have a discretionary monetary policy and free movements of capital. China limits the international flow of capital, which allows it to have a fixed exchange rate and some degree of monetary policy discretion. The UK, in 1992, tried for all three, and it blew up, driving them out of the European Monetary System, the precursor of the European Monetary Union.

## 20.5 Exchange-rate crises

As a matter of experience, fixed exchange-rate systems often collapse — sometimes spectacularly — when the central bank runs out of reserves.

We can illustrate the mechanics with the central bank’s balance sheet. Suppose that it looks like the one above, with “fx reserves” of 40. And suppose, further, that investors would like to exchange 50 worth of pesos for the same value in dollars. Once the central bank runs out of dollars, it can no longer support the exchange rate, which becomes (more or less automatically) floating.

It’s the same issue we illustrated earlier with beer: If people would prefer to buy foreign currency at the official exchange rate, and the currency is convertible, the central bank may find that its supply of foreign reserves is not enough to meet the market demand. (The market for currencies is enormous, so you need a lot of reserves.) For that reason, currency traders often look closely at the central bank’s foreign currency reserves to measure its ability to maintain a fixed rate.

What invites “speculative attacks” on a currency with a fixed exchange rate? Often, it’s a problem of [time consistency](#). A fixed exchange rate is a policy promise to exchange one currency for another at a specified price without limit into the future. If investors today expect that a future policymaker will alter that price, what will stop them from selling the “expensive” currency today? In a foreign-exchange market that transacts about four trillion dollars daily, few governments have adequate foreign reserves to fend off a run on a fixed exchange rate.

One classic currency run occurred in 1992 in the United Kingdom. As part of the European Exchange Rate Mechanism (ERM), the UK had effectively fixed its currency, sterling, to Germany's Deutsche Mark (DM). But Germany was in its post-unification economic boom and needed high interest rates to limit inflation, while the UK was in a deep recession and needed low interest rates. Doubting that UK policymakers would keep interest rates high just to maintain the fixed exchange rate, speculators sold sterling. They made a fortune when the UK exited the ERM in September 1992 and sterling plunged versus the DM.

You might ask: Should the UK have considered capital controls instead of devaluing sterling? One practical obstacle was that any hint of controls would have further encouraged investors to flee sterling before they could no longer do so. Where time consistency is lacking — in this case, in currency policy — instability often follows.

There's a big-picture question lurking behind the scenes here: whether fixed exchange rate regimes reduce volatility. With flexible rates, we tend to see a lot of short-run volatility. With fixed exchange rates, short-run volatility is low most of the time, but we occasionally have spikes in volatility when the system collapses. Neither seems completely appealing, but that's the choice we're given.

## 20.6 Strong fixes

The tendency for fixed exchange rates to blow up has led to two competing lines of thought. One is to let them float — let the pressure off, so to speak. The other is to reinforce the fixed-exchange-rate system and nail the lid down tighter. Nothing has proved foolproof to date, but you never know.

One way to reinforce a fixed exchange rate is with a currency board. The idea is to start off with a large reserve of foreign currency and limit issues of domestic currency to this amount. That way, you should not run out of foreign currency when people trade in their local currency. Argentina set up a system like this in the 1990s, and established an exchange rate of one dollar per peso. But it was dissolved in a currency crisis ten years later. Hong Kong has had such a system since 1983, with the Hong Kong dollar pegged to the US dollar. As a result, interest rates in Hong Kong mirror those in the US: it has, in a sense, inherited US monetary policy.

A more extreme arrangement is a common currency. EMU (the euro area) is the most ambitious effort along these lines to date. But it has been under stress for years, and it remains unclear whether it will survive in its current form.

## Executive summary

1. “Convertibility” and “capital mobility” refer to policies limiting currency transactions and international capital flows.
2. Foreign currency reserves are an indicator of the government’s ability to maintain a fixed exchange rate.
3. The trilemma says you can have, at most, two of the following three things: (i) fixed exchange rates; (ii) international capital mobility; and (iii) discretionary monetary policy.

## Review questions

1. Foreign exchange market intervention. Use a hypothetical central bank balance sheet to show how purchases of foreign currency affect the bank’s assets and liabilities. What does this purchase do to the supply of money (currency)?

Answer. When a central bank buys foreign currency, it receives it from private owners and gives them domestic currency in return. The latter is an increase in the domestic money supply. Suppose, for example, that the central bank starts with the balance sheet

Assets		Liabilities	
FX Reserves	100	Money	200
bonds	100		

The purchase of 25 worth of foreign currency changes the balance sheet to

Assets		Liabilities	
FX Reserves	125	Money	225
bonds	100		

2. Sterilization. Suppose that the central bank has increased the money supply by purchasing foreign currency, as described above. How might it offset this impact on the money supply (sterilize it, so to speak)?

Answer. It does an equal sale of bonds, accepting money in return. If it sells 25 worth of bonds, the balance sheet changes to

Assets		Liabilities	
FX Reserves	125	Money	200
bonds	75		

The net result of the two trades is that its liabilities are now more heavily weighted in foreign currency. If the foreign currency rises, it makes money; if it falls, it loses money. This posture is designed as protection against a sharp fall in local currency (or rise in foreign currency), and it does that.

3. Hong Kong's trilemma. Use the trilemma to explain why Hong Kong has inherited US monetary policy.

Answer. Hong Kong has (i) a fixed exchange rate against the US dollar and (ii) international capital mobility. The trilemma then tells us that it can't have its own monetary policy. Should they want their own monetary policy, either (i) or (ii) has to go.

### **If you're looking for more**

The International Monetary Fund's *Annual Report on Exchange Arrangements* is the definitive guide to exchange-rate arrangements: fixed, flexible, capital controls, and so on.





# Index

average product of labor, *see* labor

bond, 257, 258

budget deficit, *see*

government budget

capital controls, *see*

exchange rate regimes

central bank, 256–259, 261

Cobb-Douglas, *see*

production function

coincident indicator, *see*

cyclical indicators

consumer price index (CPI), *see*

price index

convergence, *see* Solow model

convertibility, *see*

exchange rate regime

countercyclical, *see* business cycle

covered interest parity, *see*

interest rate parity

credit easing, *see* monetary policy

debt, *see* government debt

default risk, *see* credit risk

deflator, *see* price index

depreciation, *see* exchange rate

excess burden, *see* tax

exchange rate

sterilized intervention, 258

exchange rate regime, 255

capital controls, 256

convertibility, 255

fixed exchange rate, 256, 259–  
261

flexible exchange rate, 256

floating exchange rate, 256

managed float, 256

pegged exchange rate, 256

speculative attacks, 259

trilemma of open-economy mon-  
etary policy, 258

expected inflation, *see* inflation

expenditure identity of GDP, *see*  
identities

fixed exchange rate, *see*

exchange rate regime

fixed-basket approach, *see*

price index

fixed-weight approach, *see*

price index

flexible exchange rate, *see*

exchange rate regime

floating exchange rate, *see*

exchange rate regime

GDP, *see* gross domestic product

GDP deflator, *see* price index

government deficit, *see*

government budget

government purchases, *see* gross do-  
mestic product (GDP)

government saving, *see* saving

income identity of GDP, *see*  
identities

inflation target, *see* monetary policy

inflation targeting, *see*  
monetary policy

interest rate, 260

interest-rate rules, *see*  
monetary policy

- intervention, [258](#)
- investment, *see* gross domestic product (GDP)
- job creation rate, *see* labor
- job destruction rate, *see* labor
- job reallocation rate, *see* labor
- job turnover rate, *see* labor
- labor market, *see* labor
- labor market equilibrium, *see* labor
- lagging indicator, *see* cyclical indicators
- leading indicator, *see* cyclical indicators
- long-run aggregate supply, *see* aggregate supply
- long-term interest rate, *see* interest rate
- managed float, *see* exchange rate regime
- monetary policy
  - policy discretion, [259](#)
  - sterilization, [258](#)
- money supply, *see* monetary policy
- net exports, *see* gross domestic product (GDP)
- nominal GDP, *see* gross domestic product
- nominal interest rate, *see* interest rate
- off-balance-sheet liabilities, *see* hidden liabilities
- open-market operation, *see* monetary policy
- partial derivative, *see* derivative
- participation rate, *see* labor
- pegged exchange rate, *see* exchange rate regime
- per capita GDP, *see* gross domestic product
- physical capital, *see* capital
- policy discretion, *see* monetary policy
- policy duration commitment, *see* monetary policy
- PPP, *see* purchasing power parity
- primary deficit, *see* government budget
- private saving, *see* saving
- procyclical, *see* business cycle
- public debt, *see* government debt
- quantitative easing, *see* monetary policy
- real GDP, *see* gross domestic product (GDP)
- real interest rate, *see* interest rate
- rules vs discretion, *see* monetary policy
- short-run aggregate supply, *see* aggregate supply
- short-term interest rate, *see* interest rate
- sovereign debt, *see* government debt
- speculative attack, *see* exchange rate regime
- steady-state unemployment rate, *see* labor
- supply of labor, *see* labor
- sustainability, *see* government debt
- Taylor rule, *see* monetary policy
- term structure of interest rates, *see* interest rate
- time consistency, [259](#), [260](#)
- total factor productivity, *see* productivity
- Treasury bill, *see* Treasury
- trilemma of open-economy monetary policy, *see* exchange-rate regime
- uncovered interest parity, *see* interest rate parity
- unemployment dynamics, *see* labor
- unemployment rate, *see* labor
- unsustainable, *see* government debt
- value-added tax (VAT), *see* tax

welfare loss, *see* tax

worker reallocation rate, *see* labor

yield, *see* bond

zero lower bound, *see*

monetary policy