

ECON 206 MACROECONOMIC ANALYSIS

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Chapter # 15

Overview

- We will discuss **nominal exchange rates**, like the number of yen (¥) per dollar (\$) and we will learn about **real exchange rates**, which are like real or relative prices of exports
- We will talk about the “Law of One Price” and **arbitrage** in goods — buying low, selling high, speculating, and equilibrating
- We will incorporate **international capital flows** into the short run model: why would capital (savings) flow into a country, and what does that do to its national income in the short run? (The answer might surprise you!)
- How is international financial system structured? How has it changed?
- What lessons can we draw from financial crises in developing countries? How are they related to exchange rates?

Exchange Rates and International Finance

Chapter 15

You probably already know what an exchange rate is

- If you've ever been to Canada or Mexico or elsewhere in the world, or if you have purchased a foreign good on eBay denominated in foreign currency, you have encountered an **exchange rate**
- Each country has its own currency, like the U.S. has its dollar (\$), and we will call the price of domestic currency in terms of foreign currency the **nominal exchange rate**
 - If you buy British goods, you need to know the pound/dollar (£ / \$) exchange rate
 - For Japanese goods, the yen/dollar (¥ / \$) rate
- A word to the wise: these days, when you travel abroad, it's best to use your ATM card to get foreign currency, or use your credit card like you would here — your bank or credit card bank will charge you a percentage of the total transaction, like 1%, and they use the current market exchange rate

Recap of Chapter 14 on international trade

Why we engage in international trade?

- We improve our well-being by **specializing** in producing what we do best, whether it's problem sets, papers, legal briefs, or donuts, and then trading some of our goods or services for those we need but don't produce, because they are **cheaper** when others produce them
- This principle, of **comparative advantage**, ought to drive trade *in the long run* — combined with the notion that **trade deficits** are like new **borrowing** from savers in the rest of the world, and you can't borrow forever
- In Chapter 15, we now discuss several aspects more directly: What determines international **prices**, and how do **savers** move their savings across borders, and what are the implications?

The exchange rate is the dollar's **price**, and we'll label it E

- Consider what happens when the exchange rate E **falls**:
- Suppose the dollar used to trade for $E = 0.5$ British pounds, but now it's fallen to **0.4** pounds — we call this a **depreciation**
- The price of the dollar has **fallen** because a holder of British currency can now get $1/E = 1/0.4 = \$2.50$ for each pound he or she trades, instead of $1/0.5 = \$2.00$
- A falling exchange rate, or dollar price, is bad for U.S. residents because it means our currency does not buy as much foreign currency as it used to
- In reverse, an **appreciation** or “strengthening” of the dollar is a rise in the exchange rate and a rise in the price of a dollar
- What do you think might happen to **U.S. exports** to Britain when the exchange rate, E , **falls** from $0.5 \text{ £ / \$}$ to 0.4 ? They might **rise**

Why might U.S. exports rise if our currency depreciated?

- If our currency depreciates, then holding other things equal, U.S. goods become **cheaper** compared to foreign goods
- Why might our exports increase? Because foreigners see that our goods are cheaper, so they substitute away from other goods and toward our goods
- BUT: When demand for our goods rises like this, what will eventually happen to the **prices** of our goods?
- The prices of our goods will be bid **up** — we might call this “arbitrage in goods” — “**arbitrage**” means that people are buying low and selling high, and making a profit, and that process will raise the price of whatever they’re buying low
- There has to be an equilibrium, right? The prices of our goods can’t rise forever; they will rise just enough to eliminate any further arbitrage profits. What is this condition of no more arbitrage?

In the **long run**, the nominal exchange rate will reflect the rates of inflation here versus abroad

$$E = \frac{P^w}{P}$$

What is the growth rate of the exchange rate, E ?

$$g_E = g_{P^w} - g_P \\ = \pi^w - \pi$$

- What will happen to the exchange rate, E , ($\text{€} / \$$), the price of the dollar, if domestic inflation, π , is **higher** than world inflation, π^w ?
- The growth rate of E , g_E , will be negative — the exchange rate ($\text{€} / \$$) will **depreciate** — the price of the dollar will fall
- Have we seen this happen?

The Law of One Price

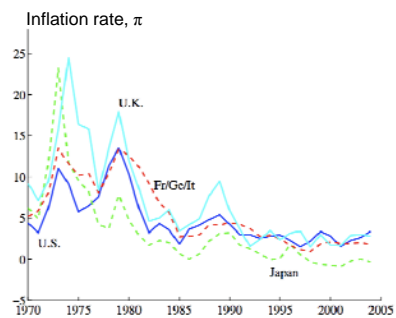
- In the **long run**, it must be the case that traders bid the prices of all goods to the same level — they have bought low and sold high as much as they can, and that has moved prices to where everything is priced the same across every economy. At this point, arbitrage profits are **zero** — nobody has incentives to export/import *more*
- What form does this Law of One Price take?
- The price in foreign currency (€), where “w” means “world” that you pay for goods

must be equal to the price in dollars (\$) times the exchange rate of foreign currency per dollar ($\text{€} / \$$)

$$P^w = P \times E$$

For example, suppose you see a Big Mac selling locally for $P = \$3.10$. If the exchange rate E is equal to $0.5 \text{ €} / \$$, then in Britain the price should be $\text{€} 1.55$

How has inflation behaved across countries over time?



•Figure 12.18 from Chapter 12 shows that inflation in the U.S., the blue line, has been higher than inflation in Japan, the green line, since 1977

•Since 1999, when the euro was formally introduced as a new European currency, U.S. inflation has also been a little more rapid than euro-area inflation, the red line

Does the Law of One Price really hold?

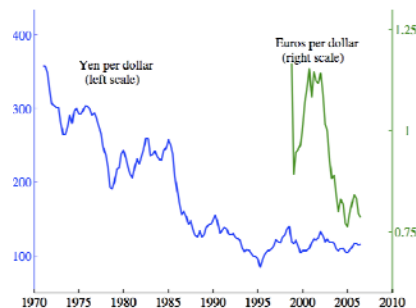
- **Not perfectly** — the text talks about the famous “Big Mac Index” published by *the Economist* magazine
- Data for 2006 were that a Big Mac costs \$3.10 in the U.S., \$1.31 in China, and \$3.77 in Europe
- But *who would actually import and export Big Macs?* Sometimes people order coffee, wine, and sometimes food coast to coast. But Big Macs are produced locally, with local labor, capital, and raw materials, which may be more or less expensive
- But applied to national price indexes, the Law of One Price tells us what the **long-run nominal exchange rate** ought to be:

In the long run, the exchange rate ($\text{€} / \$$) should be equal to the foreign price level divided by the domestic price level

$$E = \frac{P^w}{P}$$

We don’t care about the price levels at any point in time as much as we care about their **changes** — **inflation** here versus abroad!

And how have exchange rates behaved?



•The dollar has depreciated against both currencies

•The $\text{€} / \$$ exchange rate was highest up to 1985, when a series of accords between central banks set up a dollar depreciation which the relative inflation rates suggested should happen

•A wide swing in the $\text{€} / \$$ rate after introduction, probably due to uncertainty, then a decline

To examine how exchange rates affect real behavior, we want a **real exchange rate**

- We saw that the nominal exchange rate, E , may **fall** if U.S. inflation is more rapid than inflation abroad;
- If it does, so that the Law of One Price holds, then U.S. goods aren't cheaper than foreign goods, or vice-versa — no arbitrage profits
- But what if the Law of One Price doesn't always hold? What if we aren't yet in long-run equilibrium, and U.S. exports are either a better or worse deal than other countries' exports? We want to devise a measure of a "real" price that captures this
- Define the **real exchange rate**, RER , as

$$RER = E \frac{P}{P^*} = \frac{EP}{P^*}$$

Then when the Law of One Price holds, $E = \frac{P^*}{P}$ and $RER = 1$

But if **prices are sticky, in the short run**, then if E falls on its own, it lowers RER also — lowering the real price of U.S. goods — and makes U.S. exports a better deal! (because their prices haven't yet risen)

Why do domestic financial market conditions affect the demand for dollars?

- Think about a German or Japanese saver who wants to earn a return on his or her savings
- In the long run, the marginal product of capital should be the same in different countries with similar credit markets and economic growth, so maybe the saver is ambivalent about where to invest
- But now imagine that the U.S. **real interest rate**, R_t , **rises** above the marginal product of capital. What should the saver do?
- Buy up U.S. assets, since they pay a higher real return!
- But in order to buy more U.S. assets, the saver needs to translate his or her savings into dollars, so he or she demands dollars from the local bank, **raising the demand for dollars**
- So a rise in the domestic real interest rate, R_t , raises the demand for dollars because it attracts more foreign savings

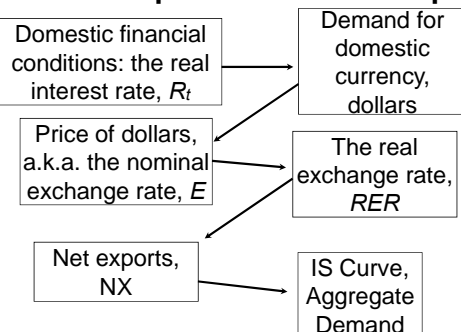
What determines exchange rates in the **short run**?

- Global currency markets are **huge!**
- The amount of foreign exchange traded *daily*, \$2 trillion, is about 12 times the amount of daily global production!
- Who trades currencies? Exporters and importers — who trade goods and services — but also **savers**, who trade money and claims on capital (like stocks and bonds)
- We will think about the **demand** for dollars in the foreign exchange market, with the supply basically fixed by the Fed
- In the **short run**, we assume that prices are sticky, just like how in the Aggregate Supply and Demand model, inflation expectations are slow to adapt ...
- So changes in the nominal exchange rate, E , will translate directly into changes in the real exchange rate, RER , and into changes in net exports

How does higher dollar demand affect the economy?

- If the demand for dollars increases, what happens to their **price**?
- It will **rise**. We say the dollar **appreciates** because the **nominal exchange rate**, E , which is the price of dollars, rises
- In the **short run**, we assume that price levels remain fixed, so the **real exchange rate** rises also
- When the real exchange rate rises, demand for U.S. exports will **fall** because the "real price" of U.S. goods has risen. Why?
- The real exchange rate is $RER = EP/P^*$. When that rises above 1, it's not profitable to export U.S. goods abroad because their exchange-rate-adjusted price, EP , is too high: $EP > P^*$
- U.S. demand for imports rises because they're a better deal
- When U.S. exports fall because they're more expensive, and U.S. imports rise because they're cheaper, U.S. net exports, NX , will fall, and Aggregate Demand falls

Conceptual roadmap



Putting it all together: Real interest rates affect net exports!

- When the domestic real interest rate, R_t , **rises**:
 - Savers want to move their savings to the U.S., so they demand dollars
 - The dollar **appreciates**; the nominal and real exchange rates **rise**
 - Net exports **fall** because the real price of U.S. goods, the real exchange rate, has risen, so foreigners demand fewer U.S. exports and residents demand more U.S. imports
- When the domestic real interest rate, R_t , **falls**:
 - Savers want to move their savings abroad, so they demand fewer dollars
 - The dollar **depreciates**; the nominal and real exchange rates **fall**
 - Net exports **rise** because the real price of U.S. goods, the real exchange rate, has fallen, so foreigners demand more U.S. exports and residents demand fewer U.S. imports
- Changes in foreign real interest rates have similar (opposite) effects!

How do we incorporate these changes into our short-run model?

- **Visually**, nothing will change in the IS-MP and AS/AD graphs! The IS Curve will still slope down, as will AD
- But two things **do** change:
 - The magnitude of the **slopes** will be different, because net exports now respond to the interest rate, R_t
 - What shifts IS and AD will now include changes in *foreign* real interest rates, and thus *foreign monetary policy* will actually affect the domestic economy!
- So the breadth of stories we can tell with AS/AD will widen

Aggregate Supply adjusts slowly upward because firms are setting their prices

- Aggregate Supply shifts upward as firms set prices higher and increase inflation, and the process stops when the new AS and the new AD intersect at $\bar{y}_t = 0$
- But as before, we're not done. Why? The Aggregate Demand shock was **temporary**: the foreign central bank cannot keep R^w high forever!
- Ultimately, AD will jump back to where it was initially!

Let's examine a rise in the foreign real interest rate in the IS-MP and AS/AD models

- Why would this happen?
- A **foreign central bank** might be fighting inflation by using its short-run model
- What do you think will happen to short-run output and inflation abroad?
- They should both *decline*
- What about short-run output and inflation here?
- Openness to investment and trade results in a mirror-image effect here: *higher output and higher inflation!*

The Aggregate Demand shock dies out when the foreign central bank returns R^w to \bar{r} , and AD shifts back

- Aggregate Supply will adjust by shifting downward, because short-run output is negative, below potential!
- This process returns us slowly to the original equilibrium!
- The shock to the real exchange rate, with foreigners buying more U.S. exports, is only temporary, but it has real, if transitory, effects on the domestic economy!

How does a rise in the foreign interest rate affect the domestic economy?

- If the foreign central bank raises its real interest rate, R^w , what do savers do?
- Buy up more foreign assets, demanding fewer dollars, lowering the nominal exchange rate, E , and the real exchange rate. What does that do to NX ?
- Increases them; Aggregate Demand shifts out immediately, and the economy jumps to the new intersection
- Aggregate Supply starts to shift up because short-run output rose

The time path of output and inflation after the temporary Aggregate Demand shock from foreign monetary policy

- Before the foreign central bank raises R^w , inflation is stable and output is growing at potential
- R^w rises, dollar demand drops as savings flow abroad the real exchange rate falls, U.S. exports increase and imports decrease, and AD shifts out, raising output and inflation *immediately*
- Aggregate Supply slowly shifts up, increasing inflation and lowering short-run output back to 0
- When R^w returns to normal, AD shifts back, *immediately* lowering output and inflation
- Aggregate Supply slowly shifts down, lowering inflation and raising output

This example shows us that international capital mobility and flexible exchange rates can **transmit** monetary policy between countries

- Is it desirable to experience booms and recessions caused by foreign monetary authorities? Probably not
- What could you do to insulate your economy from the effects of capital flows and exchange rate fluctuations?
- **Control** international **capital flows** through regulations
 - This can discourage foreign investors from investing at all, unless you have such a huge and lucrative market (like China!)
- **Fix** your nominal **exchange rate**, maybe to gold or to another currency or set of currencies
 - This stops fluctuations in net exports, but it also means that you **lose monetary policy** — your money supply and price levels must remain in lock-step with those of the target currency, since
This is like “importing Alan Greenspan” $E = \frac{P^*}{P}$

Fixed exchange rates frequently don't last forever

•Argentina, Mexico, Indonesia, and Korea have all enjoyed stability under fixed exchange rate regimes, but it wasn't permanent! Why?

•Some economists point to weaknesses in fundamentals, like too much government spending or improper lending by domestic banks

•But others have wondered whether *currency speculators* are at fault, and whether capital controls should be used

Countries face 3 goals in choosing an *international exchange regime*

- It is desirable to have a **stable exchange rate**
- **Capital mobility** — the ability of investors to send their money where it will be most productive — is also desirable
- Countries want autonomous **monetary policy** in order to maintain stable inflation and growth at potential
- The problem is: you can't have all 3 at once!

Full capital mobility <u>+Autonomous monetary policy</u> = Volatile exchange rate	Full capital mobility <u>+ Fixed exchange rate</u> = No monetary policy	Fixed exchange rate <u>+ Capital controls</u> = Autonomous monetary policy
U.S., Europe, Japan	China	Argentina, Mexico, Brazil

Historically speaking, floating rates are a recent invention!

•Prior to World War II, the global economy operated on a gold standard — good for stable exchange rates, bad because the world money supply was determined by gold discoveries! These were “golden fetters”

•After World War II, the **Bretton Woods System** pegged the dollar at \$35 per ounce of gold, other currencies pegged to the dollar

•Its demise? Desire for an independent U.S. monetary policy

We can visualize this as “the Policy Trilemma”

The goals of policy are the corners of the triangle, but countries must reside along one of the legs, each of which touches only 2 of the 3 corners

The currency board option has been popular for developing countries, but it hasn't always worked consistently!