

Econ 302 Intermediate Macro Handout 3

February 10, 2016

1 Chapter 5 Inflation

The Quantity Theory of Money

$$M \times V = P \times Y$$

- Households hold money in order to buy things
- The quantity equation tells us that the amount of money in the economy multiplied by the number of times a dollar bill is paid to someone as income must equal nominal GDP
- Remember that M/P is *real money balances*

Constant Velocity and Inflation

It is useful to assume that velocity, V , is constant (\bar{V}). Recall that we have assumed that Y is also fixed, thus we have

$$M \times \bar{V} = P \times \bar{Y} \implies M = \frac{P \times \bar{Y}}{\bar{V}}$$

So we see that a change in the money supply *must lead to a change in the price level*. This means that increasing the money supply will lead to inflation.

Inflation and Interest Rates

- The real interest rate, r , is the difference between the nominal interest rate, i , and inflation, π

$$r = i - \pi$$

- However, when a borrower and lender write a contract, they do not know what inflation will be! Thus their *expectations* about inflation will determine on what nominal rate they agree:

$$i = r + E\pi$$

Costs and Benefits of Inflation

- Unexpected inflation is *good for borrowers and bad for lenders*. If inflation is higher than expected, then borrowers pay back money that purchases less than the parties had originally thought it would
- When prices change frequently (even if it was expected), firms must spend time and effort changing prices. We call these *menu costs*. Consumers also hold lower real balances, M/P , when the inflation rate is higher, and thus they must waste time withdrawing money more frequently. We call these *shoelather costs*
- One benefit of inflation is that it allows firms to cut real wages (by not raising wages to keep up with inflation) during recessions. Being able to lower wages in real terms during a recession might help a firm avoid laying off workers

2 Chapter 6 The Open Economy

Previous we had assumed that the economy was closed. Now we relax that assumption and consider trade between countries.

Flows of Capital and Goods

GDP Expenditure Equation Revisited

Expenditure is now

$$Y = C + I + G + X - IM$$

where imports, IM , equals consumption of foreign goods, investment spending in foreign goods and services, and government purchases of foreign goods and services. Note that C, I, G include spending on foreign goods and services, so all we are doing is correcting Y to reflect only spending on *domestically-produced goods and services*.

It is convenient to denote $NX = X - IM$, and notice that

$$NX = Y - (C + I + G)$$

Put simply, net exports are what we produced minus what we spent. If we produced more than we spent, someone abroad must have purchased the extra. If we spent more than we produced, then we must have purchased the extra from abroad!

Trade Balance

Recall that savings is income minus what is spent and what the government takes:

$$S = Y - C - G$$

Thus by the expenditure equation, we have

$$\begin{aligned} S &= Y - C - G \\ &= C + I + G + NX - C - G \\ &= I + NX \end{aligned}$$

This means that *net exports must always equal savings minus investment spending*:

$$S - I = NX$$

- We call NX **the trade balance**
- We call $S - I$ **net capital outflow**

$$\text{Net Capital Outflow} = \text{Trade Balance}$$

- If both are positive, we call it a **trade surplus**. If both are negative, we call it a **trade deficit**. If both are zero we call it **balanced trade**.
- Thus if we are saving more than we are spending in investment spending, then we must be saving abroad by loaning to foreigners. And it must be that we are loaning to foreigners, because $X > IM$ and so they are buying more from us than we are from them!

An Example

Joel, an American citizen, buys 100 dollars worth of chocolates from Isabel, who runs a chocolate shop in Brussels. Let's follow the money to see what happens:

1. U.S. net exports fall, as Joel is importing chocolates from Belgium
2. U.S. savings ($Y - C - G$) fall, as Y and G do not change but C goes up (it is assumed I does not change as well)
3. If Isabel orders 100 dollars worth of romance novels on Amazon, then trade (and thus capital flows) balance out
4. However, if she buys a U.S. bond, then this is a capital inflow into the U.S. Whether through goods (romance novels) or capital (bond), the money will get back to the U.S. somehow. (If Isabel stuffs the money under her mattress, then she is investing in the U.S. economy in the form of currency)

Model of a Small Open Economy

Recall that in our closed economy, the equilibrium interest rate, r^* , was such that

$$S = I(r^*)$$

Now we have seen above that it won't necessarily be the case that $S = I$. Instead, the small open economy **takes the world interest rate as given**. Here we see why "small" is a necessary assumption: it cannot be the case that the economy affects the interest rate (otherwise it could not be exogenous!).

As before, output is fixed by the factors of production

$$Y = \bar{Y} = F(\bar{K}, \bar{L})$$

Consumption is an increasing function of disposable income

$$C = C(Y - T)$$

and investment is a decreasing function of the real interest rate

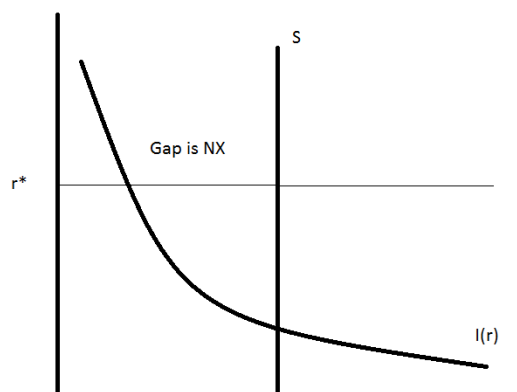
$$I = I(r)$$

Thus we have (letting r^* be the world interest rate)

$$\begin{aligned} NX &= \bar{Y} - C(\bar{Y} - \bar{T}) - G - I(r^*) \\ &= S - I(r^*) \end{aligned}$$

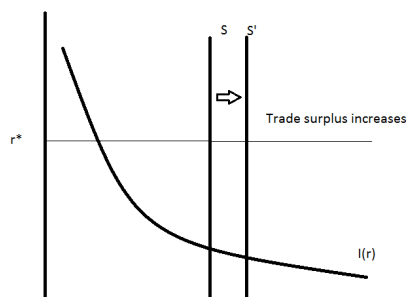
Shifts Foreign and at Home

Since the interest rate is exogenous, it no longer equilibrates savings and investment:



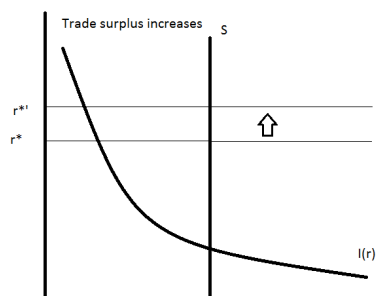
In our closed economy, the equilibrium changed when savings or investment changed. Here we have more factors:

- Fiscal Policy (Domestic)** - Recall that fiscal policy is a change in federal government spending, G , or taxation, T . Thus a change in fiscal policy could shift S by acting on G or $C(Y - T)$. The interest rate is exogenous, so it will not change, but the savings curve will shift. For example, a reduction in G increases $S = Y - C - G$, and so savings shift to the right. Thus the trade surplus increases:

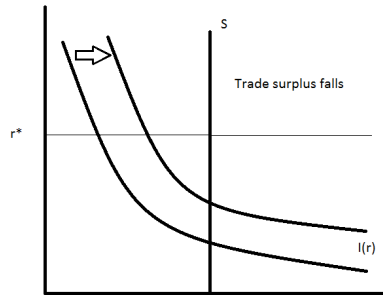


Notice that the investment depends only on the interest rate, and so it will not shift when fiscal policy changes

- Fiscal Policy (Foreign)** - Foreign fiscal policy affects our small open economy *through the interest rate*. How does this happen? Remember that planet earth is a closed economy, and thus the global interest rate *must equilibrate global investment and savings*. Consider if foreign government spending increases, then foreign savings $S_f = Y_f - C_f - G_f$ will fall, and thus the global interest must increase (exercise: why will this happen?) Domestic investment spending $I(r)$ depends on the exogenous interest rate, and so we see that $I(r)$ increases (but the curve does not shift!) and the trade surplus increases:



- **Exogenous Shift in Investment Schedule** We see that a shift in the savings curve or a change in the world interest rate will alter the trade balance. But the investment curve (which we remember is just the demand for money) can shift as well. We take such a shift as exogenous: perhaps tax incentives or a change in optimism cause people to demand more money at any price (interest rate). Then the investment curve shifts out and $S - I$ falls. NX must also fall, so if there is a trade deficit, the deficit increases and if there is a trade surplus, the surplus falls:



Exchange Rates

Nominal Exchange Rate - Relative price of two currencies: how many units of currency A does it take to buy one unit of currency B?

$$\text{Nominal Exchange Rate} = \frac{1.39 \text{ Canadian Dollars}}{1 \text{ U.S. Dollar}}$$

Real Exchange Rate - Relative price of *the goods* of two countries. It tells us the rate at which we can exchange the goods of one country for the goods of another (Mankiw 156). To see this, pay attention to units!

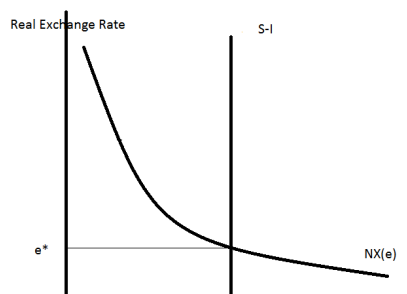
Real Exchange Rate = Nominal Exchange Rate \times Ratio of Price Levels

$$\begin{aligned} &= \frac{1.39 \text{ Canadian Dollars}}{1 \text{ U.S. Dollar}} \times \frac{5 \text{ U.S. Dollars/Bottles American Maple Syrup}}{20 \text{ Canadian Dollars/Bottles Canadian Maple Syrup}} \\ &= 0.34 \frac{\text{Bottles Canadian Maple Syrup}}{\text{Bottles American Maple Syrup}} \end{aligned}$$

Exchange Rates and Net Exports - Notice that if the real exchange rate between the U.S. and Canada is low (i.e. you can get few Canadian bottles of syrup for each American bottle), then Americans will buy American maple syrup and not Canadian maple syrup. Similarly, Canadians can turn their bottles into lots of American bottles, so they will want to buy U.S. bottles. Thus we will import less and export more. So NX increases. Therefore, we have $NX = NX(\epsilon)$ and it is a decreasing function (negative relationship between the real exchange rate, ϵ , and net exports).

Real Exchange Rate in Equilibrium

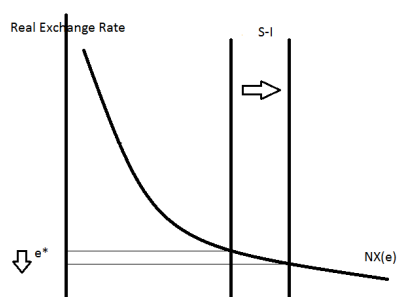
Recall that $NX = S - I$, or net exports must equal net capital outflows. In fact, the real exchange rate is determined by this equality. Think of $S - I$ as the supply of currency available and NX as foreign demand for that currency (you need a country's currency to buy their goods!)



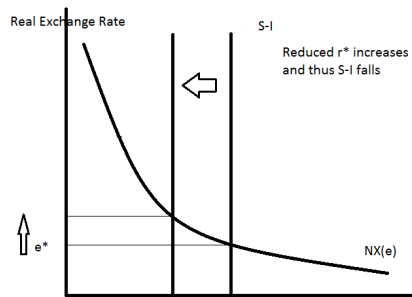
What would happen if $S - I$ did not equal NX ? If $NX > S - I$, then foreign demand for domestic currency would be greater than the excess savings available to foreigners. This means that the real exchange rate must rise, as foreigners are willing to offer more of their own currency and goods to hold our currency. The opposite would occur if $NX < S - I$.

Shifts

- **Fiscal Policy (Domestic)** - If excess savings increase (perhaps G falls), then there is a higher supply of dollars available for foreigners. Thus the dollar becomes less valuable and the real exchange rate falls. Therefore, domestic goods are less expensive relative to foreign goods, and so NX rises:



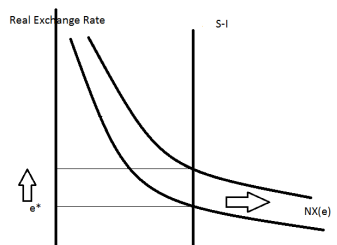
- Fiscal Policy (Foreign)** - As we saw above, foreign fiscal policy can affect the world interest rate that our small open economy takes as exogenous. This alters $S - I$, and thus will lead to a shift in the supply of currency available for foreigners. Assume foreign G decreases, leading to an increase in foreign savings and thus a decrease in the interest rate r^* . A lower interest rate will increase domestic investment, reducing the supply of currency ($S - I$) and causing the real exchange rate to rise. This means that domestic goods are more expensive, and so net exports fall:



- Exogenous Shift in Investment Schedule** - As above, exogenous changes can cause a change in investment at any given interest rate. This will shift $S - I$. Exercise: tell a story about an exogenous shift in investment demand and draw out how this will affect the real exchange rate and net exports.

Protectionism: An Example

Suppose that the government of our small open economy wants to develop its wine industry. It passes a law banning the import of foreign wines. Thus at all levels of the real exchange rate, NX increases. However, since we have assumed $S - I$ is fixed (because the factors of production are fixed and government fiscal policy did not change), the shift out of the NX curve leads to a higher real exchange rate:



Clearly, equilibrium NX did not move. At the higher exchange rate, domestic goods are more expensive, and thus our exports fall as well. So the overall level of trade fell, even if the difference between exports and imports remained the same.

Nominal Exchange Rates

From the definitions above, we have (note P is the domestic price level)

$$\text{Nominal Exchange Rate} = \text{Real Exchange Rate} \times \frac{P^*}{P}$$

Using what we know about rates of change (or for a refresher and good exercise, totally differentiate and then divide by the nominal interest rate), we have

$$\begin{aligned}\% \text{Change in Nominal Rate} &= \% \text{Change in Real Exchange Rate} + \% \text{Change in } P^* - \% \text{Change in } P \\ \% \text{Change in Nominal Rate} &= \% \text{Change in Real Exchange Rate} + \text{Difference in Inflation Rates}\end{aligned}$$

The main insight here is that domestic monetary policy can affect the nominal exchange rate through inflation.

3 Exercises

- **Mankiw - 6.1** Use the model of the small open economy to predict what would happen to the trade balance, the real exchange rate, and the nominal exchange rate in response to each of the following events.
 1. A fall in consumer confidence about the future induces consumers to spend less and save more.
 2. A tax reform increases the incentive for businesses to build new factories.
 3. The introduction of a stylish line of Toyotas makes some consumers prefer foreign cars over domestic cars.
 4. The central bank doubles the money supply.
 5. New regulations restricting the use of credit cards increase the demand for money.
- **Mankiw 6.4** - What will happen to the trade balance and the real exchange rate of a small open economy when government purchases increase, such as during a war? Does your answer depend on whether this is a local war or a world war?
- **Mankiw 6.5** - A Case Study in this chapter concludes that if poor nations offered better production efficiency and legal protections, the trade balance in rich nations such as the United States would move toward surplus. Let's consider why this might be the case.

1. If the world's poor nations offer better production efficiency and legal protection, what would happen to the investment demand function in those countries?
 2. How would the change you describe in part (1) affect the demand for loanable funds in world financial markets?
 3. How would the change you describe in part (2) affect the world interest rate?
 4. How would the change you describe in part (3) affect the trade balance in rich nations?
- **Mankiw 6.8** - Suppose China exports TVs and uses the yuan as its currency, whereas Russia exports vodka and uses the ruble. China has a stable money supply and slow, steady technological progress in TV production, while Russia has very rapid growth in the money supply and no technological progress in vodka production. On the basis of this information, what would you predict for the real exchange rate (measured as bottles of vodka per TV) and the nominal exchange rate (measured as rubles per yuan)?