hand out review sheet and answers for test; old test loaded up on the course website

Finish our discussion of international topics for the time being by completing our discussion of international finance and turning to open economy macroeconomics.

last time we were discussing what happens if our price level $P$ is rising, particularly if the idea of purchasing power parity holds
then our goods get relatively more expensive and other country’s goods are thus relatively less expensive, so we want more of their goods and they want less of our goods (and we also want less), so pressure for $X$ to go down, $M$ to go up, and thus $NX$ to go down (get more negative)
this now gives another reason why the AD curve is downward sloping in $P$-$Y$ space
In order to offset this price rise we need our exchange rate to depreciate

real exchange rate $= e \cdot \frac{P}{P^*}$, where $P$ = U.S. price level and $P^*$ = other country’s price level

in order to keep the real exchange rate the same, the exchange rate should fall, so the $\$$ depreciates (see this as a leftward shift in demand for $\$$ and a rightward shift in supply of $\$$, so $e$ goes down)

so rewrite the $NX$ function to incorporate relative prices: $NX = f(e, Y/Y^*, P/P^*)$

let’s finish discussing the international monetary system first by defining the balance of payments and seeing the ways in which governments can intervene in the international monetary system

Let’s bring those ideas into our formal model
last class we modeled the link between $NX$ and the exchange rate and other things:
$NX = f(e, Y/Y^*, P/P^*)$
now let’s also talk about the other interaction between one country and the rest of the world, capital flows (in particular financial capital flows); these move in response to changes in the interest rate
so capital flows $CF = CF(r)$, with a positive relationship between $r$ and $CF$
or more generally $CF = CF(r/r^*)$, where what really matters is the relative size of our interest rate relative to other countries’ interest rates (so $r^*$, the interest rate in other countries, is negatively related to capital flows into our country)

so $BOP = CF + NX$
In LR equilibrium, $BOP = 0$ (assuming a country can’t run a BOP surplus or deficit forever)
so $0 = CF + NX$

note this means that if $NX < 0$, $CF > 0$
in other words, if we have a current account deficit, we have to have a capital account surplus
to bring this all together in one equation, $BOP = f(e, Y/Y^*, P/P^*, r/r^*)$
we’re trying to finish up our circular flow model of the economy by allowing for these additional outflows and inflows through trade

thinking about increasing other countries’ imports from us (and thus our exports), we’ve been talking about China a lot in terms of the exchange rate and our high level of imports from it but it is also notable how much it imports from other countries (so that we and others are exporting to them)

http://www.economist.com/node/17363625
So China’s economic growth can be good for us in this sense

let’s start from the last equation in the powerpoint and note one other thing:

$$(X - M) = (S - I) + (T - G)$$

note we can define total savings for the society as the sum of private saving $S = Y - T - C$, and public saving $T - G$ (which can be negative)
so total savings $= S + T - G$
capital account $= I - \text{total savings}$
capital account = I – S – T + G, which is just the opposite of the rhs in the equation

and capital account + current account = 0 in BOP equilibrium

(I – S – T + G) + (X – M) = 0

so CF = I – S – T + G

note I could imagine 3 types of economies in this formal model:
CF = 0 – the closed economy (technically could still be open so long as X = M exactly)
r = r, the small open economy, where they are so small that they have no effect on the
(international) interest rate (they are a price-taker in the capital market)
CF = CF(r), the large open economy, where we can move our interest rate and thus affect our
capital inflows and outflows

in your practice problems for today (and on the next problem set) you can see how these
assumptions can be built into the model we’ve been doing throughout the last few weeks

Note that this points out how important it is to know what model someone is talking about when
they are making statements about what will happen under various policies.
We’ve already seen that you for instance need to specify whether you’re in the LR or the SR in
discussing what will happen to things like total output Y
Now it will also be important to specify whether you think the economy is open or closed, and
large or small if it is open
We’ll see as we move into the macro policy section of our course that the starting assumptions of
one’s model are really critical for deciding what the effects of various policies will be—
sometimes you can get exactly opposite effects.
And thus one reason why policy analysts may disagree is because they feel that different models
describe the real world!!!!

Let’s look at the fullest statement of the model of the economy that we have been working with
for the past few weeks
[show overhead/handout]
The international monetary system (part 2)

• What is the balance of payments?
• Intervention in currency markets

What is the balance of payments?

• Current account = NX = X - M
• Capital account = sales of domestic assets to foreigners - purchases of foreign assets
• The balance of payments (BOP) = current account + capital account

What is the balance of payments? (cont.)

• In a free/floating exchange rate system, exchange rates adjust to make BOP = 0
• In a fixed exchange system, the balance of payments need not balance
  – A BOP surplus normally means that the current account is positive and greater in absolute value than the capital account
  – A BOP deficit would be the opposite

Intervention in currency markets

• Why intervene?
• Types of intervention

Why intervene?

• Concern that floating rates are too unstable
• Desire to run a BOP surplus for political reasons
• Desire to rein in a country’s ability to carry out monetary policy on its own
• Desire to counter currency market speculators
Types of intervention

- Fixed exchange rates
  - metallic standards
  - fixed without support
  - fixed/targeted with govt. intervention
- Currency controls
- Managed floats

Metallic standards

- This means a currency is convertible into units of metal at a stated conversion rate
- Classical gold standard
  - currencies defined in terms of gold
  - a BOP deficit meant the govt had to sell (export) gold to finance the deficit
  - this contracted the country’s money supply and raised interest rates

Metallic standards (cont.)

- Problems with the gold standard
  - Discovery of new gold caused inflation (e.g., Spain after importing New World gold)
  - But overall, the supply of gold did not keep up with the world’s need to expand the supply of money
  - Also, not all countries wanted to maintain this lockstep money supply policy

Targeted with intervention

- The government can buy and sell reserves of foreign currency to compensate for shifts in demand or supply for their currencies in order to maintain the fixed exchange rate
- This can allow the balance of payments to remain in surplus or deficit

Targeted with intervention (cont.)

- A balance of payments deficit cannot be maintained forever in this way as the country will run out of reserves of foreign currency
- However a balance of payments surplus can continue so long as the country is willing to keep adding to its reserves of foreign currency
Definitions

- A closed economy: One that does not trade with other nations (so $NX = X = M = 0$)
- An open economy: One that trades with other nations
  - Small open economy: can’t affect $r$
  - Large open economy: can affect $r$

Open economy macroeconomics

- Definitions
- Macroeconomic effects of international trade and finance
- Curing the trade deficit

Macroeconomic effects of international trade and finance

- A $\Delta$ in relative prices through a $\Delta$ in price level or a $\Delta$ in exchange rate changes a country’s $NX$
- A $\Delta$ in exports or imports has direct and multiplier effects on GDP
- So a boom or recession in one country affects other countries through trade
Macro effects of international trade and finance (cont.)

- Why would a country want to run a balance of payments surplus?
- To raise national output, or keep it at a high level

The Effects of Higher Net Exports

Exchange Rates and Home Currency Prices

<table>
<thead>
<tr>
<th>Exchange Rate</th>
<th>¥30,000 Japanese TV Set</th>
<th>$1,000 U.S. Home Computer</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1 = 1.20 yen</td>
<td>¥30,000</td>
<td>$250</td>
</tr>
<tr>
<td>$1 = 1.00 yen</td>
<td>¥30,000</td>
<td>$300</td>
</tr>
</tbody>
</table>

The Effects of Exchange Rate Changes on AD

Macro effects of international trade and finance (cont.)

- if a country’s currency depreciates or is devalued:
  - its relative price level is lower
  - X rises and M falls, so NX rises
  - so AD rises
- The opposite happens if the country’s currency appreciates or is revalued

- now add one more link: what if a country’s interest rates rise?
  - attracts foreign capital inflows
  - demand for currency rises, so currency appreciates
  - X falls and M rises, so NX falls
  - so AD falls
- The opposite happens if the country’s interest rates fall
Curing the trade deficit

• Note how the National Income identity can be rearranged:

\[ Y = C + I + G + (X - M) \]

note \( C = Y - T - S \)

so \[ Y = Y - T - S + I + G + (X - M) \]

\[ 0 = (I - S) + (G - T) + (X - M) \]

rearrange this to:

\[ (X - M) = (S - I) + (T - G) \]

Curing the trade deficit (cont.)

The current account (US: trade deficit) =
the private savings budget (for the US, a surplus)
+ the government budget (for the US, a deficit)

\[ (X - M) = (S - I) + (T - G) \]

Curing the trade deficit (cont.)

• So how can the trade deficit be reduced?

\[ (X - M) = (S - I) + (T - G) \]

– increase savings
– decrease investment
– decrease the government deficit
– and encourage other countries to grow (X)
Here is a full accounting in algebraic terms of the model of a country’s economy that we have been developing over the course:

Consumption function:  \( C = f(Y_D) \)
Investment function:  \( I = f(r,Y) \)
Government spending:  \( G = G_0 \)
Disposable income definition:  \( Y_D = Y - T \)
Taxes:  \( T = f(Y) \)
Net exports:  \( NX = f(e, Y_D/Y_D*, P/P*) \)
Capital flows:  \( CF = f(r/r*) \)
Aggregate demand definition:  \( AD = C + I + G + NX \)
Money demand:  \( M_D = f(r,Y) \)
Money supply:  \( M_S = \bar{M}/P \)
Labor demand:  \( L_D = f(w,Y) \)
Labor supply:  \( L_S = f(w,P) \)
Production function:  \( Y = f(L) \)
Price expectations:  \( P^e = \bar{P}^e \)
Short-run aggregate supply (SRAS):  \( Y = f(\bar{Y}, P, P^e, w) \)
Long-run aggregate supply (LRAS):  \( \bar{Y} = f(\bar{L}) \)

All starred items are for other countries and thus out of our control, so can be treated as constants in the model. Sometimes we also assume other things are fixed (e.g., \( P \) or \( r \)) or that some things are not in the model (e.g. \( T \) or \( NX \)) for particular special cases. There are parts that could be expanded further, such as allowing price expectations to change over time, or specifying the components of \( NX \) (\( X \) and \( M \)) in detail.

The short-run equilibrium conditions are:
goods market equilibrium:  \( Y = AD \)
money market equilibrium:  \( M_D = M_S \)
labor market equilibrium:  \( L_D = L_S \)
AS-AD equilibrium:  \( AD = SRAS \)
balance of payments equilibrium:  \( BOP = NX + CF = 0 \)
After substituting in everything else from above, we can solve these 5 equations for the 5 key variables Y, P, r, e, and w. Note that four of these are basically prices (P, r, e, and w).

The long-run equilibrium condition is:

full-employment output in the goods market: \[ AD = SRAS = LRAS = Y \]

which is equivalent to specifying

full employment in the labor market: \[ L_D = L_S = \bar{L} \]

Then one can solve for P, r, e, and w, the prices that support the long-run output level \( Y \).

In this model, fiscal policy will consist of changing G and/or the form of the tax function T. Monetary policy will consist of changing \( M \). Exchange rate policy can include setting \( e = \bar{e} \). Labor market policy can include setting \( w = \bar{w} \). Some of these policies can cause the economy to remain out of long-run equilibrium for extended periods.
I. An economy can be characterized by the following three equations:

Goods market equilibrium: \[ Y = 100 + 0.75Y + 50 - 5r + 100 + NX \]

Money market equilibrium: \[ 100 - 10r + 0.1Y = 80 \]

Balance of payments: \[ CF + NX = 0 \]

1) If \( CF = 0 \), what must \( NX \) equal?
2) What are the equilibrium values of \( Y \) and \( r \)?

II. Now suppose the model becomes instead:

\[ Y = 100 + 0.75Y + 50 - 5r + 100 + NX \]
\[ NX = 50 - 50e \]
\[ 100 - 10r + 0.1Y = 80 \]
\[ r = \bar{r} \]

1) If \( \bar{r} = 10 \), what are the equilibrium values of \( Y \) and \( e \)?
2) Is there a current account surplus or deficit? If so, how much?

III. Now suppose the model becomes instead:

\[ Y = 100 + 0.75Y + 50 - 5r + 100 + NX \]
\[ NX = 50 - 50e \]
\[ 100 - 10r + 0.1Y = 80 \]
\[ CF = 5r - 50 \]
\[ CF + NX = 0 \]

1) What are the equilibrium values of \( Y \), \( r \), \( e \), and \( NX \)?
2) If \( CF = 10r - 50 \), what are the equilibrium values of \( Y \), \( r \), \( e \), and \( NX \)?