Lecture Notes 11

Open Economy Macroeconomics

In these lecture notes, we begin the discussion of issues related to international economics.

From the perspective of the IS/LM model, much of our concern will focus on the determination of $NX$ in the IS equation
In doing this, note that $NX$, net exports, is defined as

$$EX - P_{IM/EX} IM$$

where $EX$ equals exports, $IM$ equals imports, and $P_{IM/EX}$ is the price of imports in terms of exports.

Why do we need the term $P_{IM/EX}$? Remember that the terms $EX$ and $IM$ are units of output. Remember that the terms $EX$ and $IM$ are units of output.

If imports are more expensive than exports, then $P_{IM/EX} > 1$. So, a unit of imports would require more than 1 unit of income to purchase.
Exchange Rates

Export and import demand can only be understood once one has characterized the prices of imports and exports. This requires that one consider exchange rates, which measure the way in which currencies may be converted to one another. I concentrate on floating exchange rates, which refer to exchange rates that are market determined.

As an example, suppose that a bottle of French wine costs 50 euros. What is the cost to a US consumer in dollars? The cost is determined by the rate at which euros are converted to dollars. This is what is captured by the nominal exchange rate. The word nominal refers to the fact that we are focusing on how units of one currency convert to units of another, and are not accounting for the price levels in the different countries.
The nominal exchange rate will be denoted $e$

$e$ is defined as the number of units of a foreign currency that may be exchanged for 1 dollar.

If 80 Japanese yen are required to purchase 1 US dollar, then the nominal exchange rate is 80.

There are markets for foreign exchange which determine exchange rates between currencies for those countries where the exchange rate is allowed to float.

The supply and demand for currencies determine the nominal exchange rate in such cases, as is standard for any market.
There is a distinct exchange rate for each foreign currency relative to the US dollar.

When I refer to “the exchange rate” I am therefore oversimplifying.

For each country $a$, we can in principle let $e_a$ denote the exchange rate between the currency of country $a$ and US dollars and discuss the effects of each exchange rate on the US economy. However, this would be far too complicated for our purposes.

Therefore, we will in general treat the rest of the world as a single “other” economy. One can interpret the exchange rate for the rest of the world as an index of the country the country-specific exchange rates just as we did in thinking about price indices.
**Jargon/Terminology**

The US dollar is said to be relatively “weak” when it purchases relatively few units of a foreign currency.

The US dollar is said to be relatively “strong” when it purchase relatively many units of a foreign currency.

When $e$ declines, the dollar is said to *depreciate*.

When $e$ increases, the dollar is said to *appreciate*. 
Examples of Current Nominal Exchange Rates

For 2/25/05

(All taken from 2/27/05 New York Times)

Canada (dollar): 1.24
Chile (peso): 576
European Union (euro): .76
India (rupee): 43.6
Japan (yen): 105
Norway (krone): 7.0617
Russia (ruble): 27.7
South Korea (wan): 1008
Nominal Versus Real Exchange Rates

The key idea in understanding how exchange rates affect net exports $NX$ and thus affect the IS curve is that exchange rates affect the relative prices of exports and imports and therefore affect their demand. But what is the relevant variable for measuring the relative price of an imported good versus a domestic good?

To think about this question, it is necessary to distinguish between nominal and real exchange rates. To do this, one needs to identify how much a dollar can purchase in domestic goods versus how much a dollar can purchase in foreign goods, once one accounts for the nominal exchange rate.
1 US dollar can purchase $\frac{1}{P}$ units of domestic output.

To determine what 1 US dollar can purchase in terms of foreign output, we proceed in two steps.

First, 1 US dollar can be used to purchase $e$ units of foreign currency.

Second, letting $P^*$ denote the price level for foreign goods measured in foreign currency units, it must be the case that 1 unit of foreign currency can purchase $\frac{1}{P^*}$ units of foreign output.
Therefore,

1 US dollar can be used to purchase $\frac{e}{P^*}$ units of foreign output.

If we take the ratio of the domestic purchasing power of 1 US dollar in foreign goods to the purchasing power in domestic good, we have the real exchange rate, defined as

$$\frac{e/P^*}{1/P} = \frac{e \times P}{P^*}$$

This measures the price of foreign goods relative to domestic goods.

The real exchange rate is increasing in $e$ and $P$ and decreasing in $P^*$, as would be expected.
Purchasing Power Parity

The real exchange rate determines export and import demand. However, the nominal exchange is the “price” that is determined in the market for foreign exchange.

The basic long run theory of nominal exchange rate determination is based on the idea of purchasing power parity (PPP).

Definition: in a world with purchasing power parity, each unit of currency can buy the same amount regardless of location.

This is an application of the law of one price.
What does the idea of PPP mean operationally? It means that the amount of output 1 US dollar can buy should, in the long run, be equal whether one considers domestic goods or foreign goods.

In other words,

\[
\frac{1}{P} = \frac{e}{P^*}
\]

or

\[
e = \frac{P^*}{P}
\]

Therefore, the nominal exchange rate reflects price level differences across economies.
This idea has implications for movements of nominal exchange rates and inflation

Suppose that there is inflation in the US whereas the price level $P^*$ is constant. According to the PPP theory of exchange rate determination, $e$ should decline, i.e. the exchange rate will depreciate.

Intuitively, higher domestic prices mean that the value of US dollars is lower relative to the foreign currency. The foreign currency’s ability to purchase foreign goods is undiminished.

Similarly, inflation in a foreign country with constant US prices will lead to an appreciation in the exchange rate.
Important implication: efforts by a government that produce inflation will alter the nominal exchange rate and thereby can affect export and import demand.

Empirically, PPP will not hold exactly.

One reason for this is that some goods are nontradeable, e.g. haircuts. The logic only applies to tradeable goods.

A second reason is that price index numbers are imperfect. Unmeasured quality differences may mean that tradeable goods are not fully comparable.

Again, PPP is a long run theory. Short run deviations are not inconsistent with the theory.
Exchange Rates and Aggregate Demand

How can we introduce exchange rate considerations into IS/LM analysis. The simplest way is to model the level of net exports to depend on the real exchange rate, i.e. replace the exogenous level of net exports with a function

\[ NX\left( \frac{e \times P}{P^*}, Y, Y^* \right) \]

The basic idea is that net exports depend on 4 factors:

1. nominal exchange rate
2. relative prices of domestic and foreign goods
3. real income in the US
4. real income in other countries (represented by \( Y^* \))
How should be interpret the variables in the $NX$ function?

\[ \frac{e \times P}{P^*} \] is the real exchange rate. It tells us about relative cost of foreign goods to domestic goods. Higher values imply higher imports, lower exports.

$Y$ is real US income. Presumably, US demand for imports is increasing in US real income.

$Y^*$ is real foreign income. Presumably, foreign demand for US exports is increasing in foreign real income.
It is useful to decompose net exports into components that reflect imports and exports. Exports may be described by the function

\[ EX \left( \frac{e \times P}{P^*}, Y^* \right) \]

One expects foreign demand for US goods to depend only foreign income, not US income.

Imports may be described by the function

\[ IM \left( \frac{e \times P}{P^*}, Y \right) \]

since US demand for foreign goods presumably is determined only by US income.
Capital Flows and Trade Deficits

Trade deficits and surpluses have important implications for understanding the evolution of asset holdings and capital flows.

Recall the national income identity:

\[ Y = C + I + G + NX \]

We may rewrite this equation as

\[ Y - C - G = I + NX \]

\( Y - C - G \) represents domestic savings, \( S \)

\( I \) represents domestic investment
Together, this means that domestic savings minus domestic investment equals net exports, i.e.

\[ S - I = NX \]

The basic idea is that if savings is less than investment, then it must be the case that this investment is met by negative net exports, i.e. by imports of goods from the rest of the world.

In contrast, if the level of savings is greater than investment, this savings requires that Americans acquire assets from the rest of the world in exchange for domestic goods.

Mankiw introduces the idea of a market for loanable funds. The supply of loanable funds is \( S \). The demand for loanable funds is \( I + NCO \).
Note: The US runs large trade deficits with the rest of the world.

Suppose the US (counterfactually) runs a trade surplus with the rest of the world. What does the US receive in exchange for providing these exports to the rest of the world? The answer is financial assets.

These assets may be in the form of foreign currency, foreign government bonds, etc. Together, they represent a net capital outflow (NCO) from the US to the rest of the world. With a surplus, the US, in exchange for its goods, receives financial assets; the goods are allowed for capital formation via investment.

The associated identity is:

\[ NX = NCO \]
When the US runs a trade deficit with the rest of the world, foreign countries are supplying goods to the US in exchange for US assets: dollars, US government bonds, etc. This is a capital inflow to the US.

**Capital flight**

If the rest of the world experiences an exogenous increase in demand for US assets, this reduces interest rates here in that it may be thought of as a reduction in $NX$, via the net capital outflow/net exports identity.

Instability in other economies sometimes leads to large shifts of this type. This is sometimes known as *capital flight*. 
Implications for IS/LM

1. Import demand can reduce multiplier effects

To see this, suppose that import demand is endogenized so that

\[ IM = z_0 + z_1 Y + z_2 \frac{e \times P}{P^*} \]

If \( z_1 > 0 \), then this reduces the multiplier. Why? Part of the effect of changes in income on consumption is diverted to imports. Why don’t we worry about endogenizing exports? They depend on foreign income, not domestic.

2. If small economies have larger import propensities, then the effect of government spending in such economies is smaller than for larger ones.