International Finance 4832
Lecture 7: Open Economy Macroeconomic Policy in the Short Run

Camilo Granados
The University of Texas at Dallas
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Currency Mkt

IS-LM-FX

goods market

Money market

(eq)

General Equilibrium { Markets Connected by Int. Rate

Y is no longer constant

(is affected by: ER, TB, Money, C, ...etc)

Outline

Before:

1. (Accounting) Measure of International Transactions (BOP) and wealth (NFA)
2. CA $\neq 0 \Rightarrow$ borrowing/lending with ROW
3. The Long Run Budget Constraint (LRBC): PV of CA flows $\overset{-}{=}$ PV of wealth minus
4. Gains from financial globalization (international lending/borrowing)

   Consumption smoothing, efficient investment, risk diversification

Now: (Chapter 18) Policy Framework for analyzing the Open Economy

Open Economy IS-LM (or IS-LM-FX model)

The model links: Money market, FX market and Goods market equilibria

Next: Part 3, Economic Policy Applications

Where we left

Now we use what we studied on the FX market and the Exchange Rate (in short run)

Foreign Exchange market $\longrightarrow$ modeled via UIP Domestic Returns = Foreign Returns

Money market $\longrightarrow$ modeled with the quantity theory of money

Before: we assumed output was constant (Y) (e.g., in $M/P = L(i)Y$) Y no longer constant (Determined within the model)

Now we include the **Goods Market** into the model ... allowing Y to change

We consider a short run model $\longrightarrow$ Prices are fixed (sticky prices)

IS-LM model setup extended to work for Open Economies

Incorporates: $E_{h/f}$, TB

Focus: home country vs. ROW

The model considers each element of Y: $Y = C + I + G + TB$

Simple long run budget constraint

Some simplifying assumptions

1. Short run: prices are fixed, inflation is zero

   (thus we can speak about real and nominal quantities as if they were the same)

2. Government policy is constant ($\bar{G}$, $\bar{T}$)

   later we allow changes in Fiscal Policy

3. Foreign output and interest rate are both constant and exogenous: $\bar{Y}*$, $\bar{i}*$

4. $NFIA = 0$, $NUT = 0$, then: $CA = TB$

Now, let's look at each of the GDP's components ...

Consumption

"C" in $Y = C + I + G + TB$

Model consumption as a function of (disposable) income:

$$C = C(Y - \bar{T})$$

Notice the parenthesis here denotes $C()$ is a function, and not C times $Y - T$

This function $C()$ increases in disposable income $Y - \bar{T}$

Slope of consumption: marginal propensity to consumption (MPC)

$MPC + \underbrace{MPS}_{\text{Savings}} = 1$

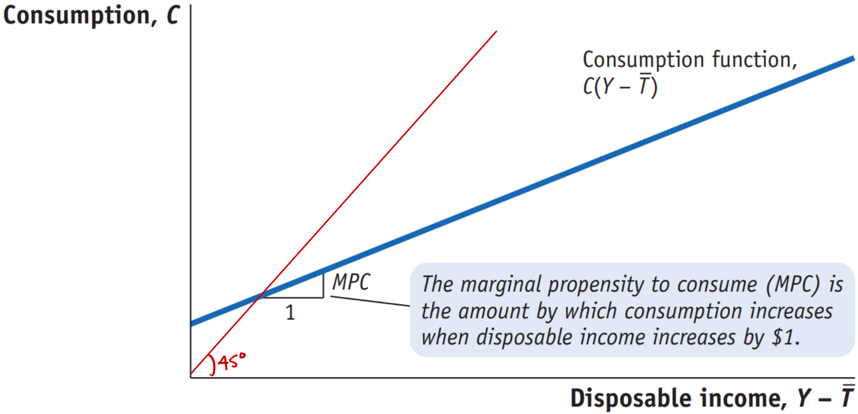
Example:

$$C = 3 + \underbrace{0.75}_{0 < MPC < 1}(Y - \bar{T})$$

Here the $MPC = 0.75$, i.e., for any extra dollar of disposable income the households spend 75 cents

Consumption function

Figure: Consumption



$0 < MPC < 1$

Investment

"I" in $Y = C(Y - T) + I + G + TB$

Many possible investment projects, each paying a different real return (e.g., Google, open a food truck, buy a farm, etc)

Projects whose rate of return is greater than expected real interest will be undertaken

$$r_{\text{project}} > r$$
$$r_{\text{project}} > i - \pi^e$$

If $i \downarrow$ $\longrightarrow$ Invest in More projects

$\Rightarrow \uparrow$ aggregate Investment

In the short run $\pi^e = 0$ (sticky prices), then:

$$r_{\text{project}} > i$$

i.e., we just need the real return of projects to be equal or greater than normal interest rates

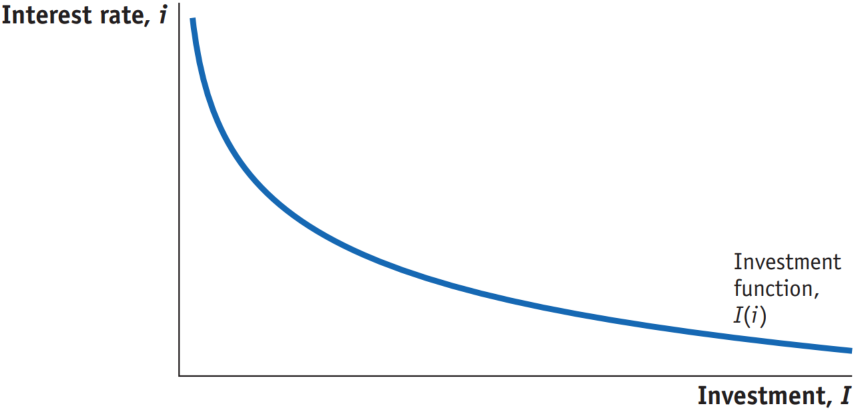
Negative relationship between the aggregate investment and the interest rate:
The lower is i the more projects will be undertaken $\longrightarrow$ the higher the total investment (I)

Total investment: I $\longrightarrow$ decreasing function of i

$$I = I(i)$$

Investment function

Figure: Investment



Government

Revenue of Gov

"T" and "G" in $Y = C(Y - T) + I + G + TB$

Spending by Gov

Revenue: Collects taxes T

Expenditure: Purchases of public consumption goods G

T, G are assumed exogenous and fixed (do not depend systematically on other factors in the model)

To denote this explicitly we use bars: $\bar{T}$, $\bar{G}$

Link with the households: for households the disposable income will be the remainder after paying taxes: $Y - \bar{T}$

We later allow for **Fiscal Policy**: that is, changes in G, T

These quantities will change at the discretion of the government and policymakers …

…and not as a response to other variables (then we still maintain that these variables don't depend on model's features)

Trade Balance

"TB" in $Y = C(Y - T) + I + G + TB$

Drivers of Trade Balance:

1. Prices: Real exchange rate (EP^*/P)
2. Incomes: home and foreign (the higher, the more demand of each location for imports) (Y, Y^*)

That is:

$$\overset{X - IM}{\overset{\uparrow}{TB}} = TB(\underset{+}{EP^*/P}, \underset{-}{Y - \bar{T}}, \underset{+}{Y^* - \bar{T}^*})$$

TB *increases* in EP^*/P $\rightarrow \uparrow RER \rightarrow \uparrow TB \rightarrow \uparrow Y$

TB *decreases* in $Y - \bar{T}$

TB *increases* in $Y^* - \bar{T}^*$

Furthermore, with fixed prices we can see that TB increases in E too (i.e., in nominal ER too)

↳ w/ sticky prices $\rightarrow \uparrow E \Rightarrow \uparrow RER$

Let's look at each of these components driving the TB . . .

Trade Balance and the Real Exchange Rate

Real Exchange Rate:

$$q_h = \frac{E_{h/f} P_f}{P_h}$$

↳ RER (q)

⇒ If $\uparrow E_{h/f} \rightarrow \uparrow TB$

In the long-run, by PPP if follows that $q_h = 1$

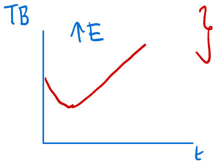
In the short-run, prices are fixed and changes in $E_{h/f}$ lead to proportional changes in q_h

(we can think of the Real and Nominal ER as analogous variables only due to sticky prices)

If $E_{h/f}$ **falls** $\longrightarrow$ foreign goods become cheaper relative to home goods $\longrightarrow$ buy more foreign, sell less home goods (import more, export less) $\longrightarrow \downarrow$ **TB**

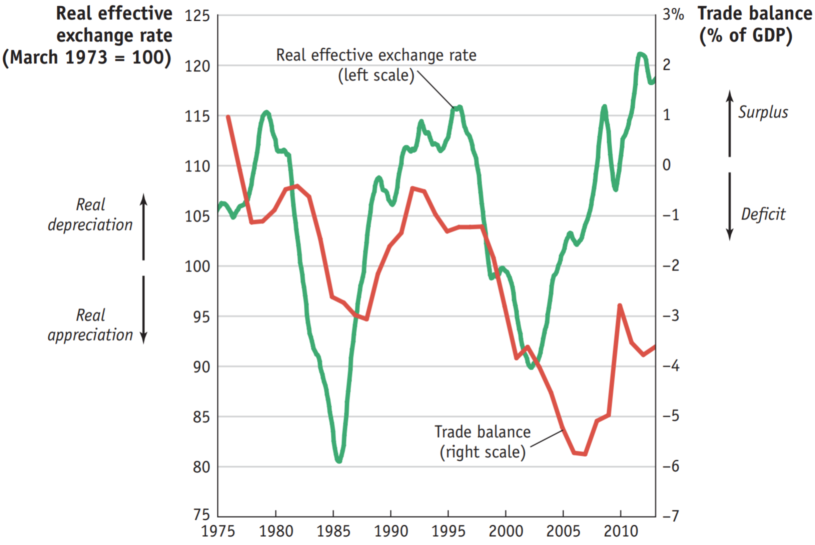
If $E_{h/f}$ **rises** $\longrightarrow$ foreign goods become expensive relative home goods $\longrightarrow$ buy less foreign, sell more home goods (import less, export more) $\longrightarrow \uparrow$ **TB**

Therefore: *TB* is increasing in the Exchange Rate (real or nominal)



J-Curve

Trade Balance and Real Exchange Rate in the US



Source: FRED

Trade Balance and Income levels

An increase in **disposable income** leads to higher consumption

This is true in any location: home or foreign . . .

. . . and for any kind of goods consumed, including *imports*

higher Imports

Then:

- An increase in home disposable income ($Y - \bar{T}$) leads to an increase in *home imports* $\longrightarrow \downarrow$ TB
- An increase in home disposable income ($Y^* - \bar{T}^*$) leads to an increase in *home exports* $\longrightarrow \uparrow$ TB

higher exports

What about the taxes? $\longrightarrow$ link between fiscal policy and trade balance
(We'll see the overall effect later)

Shocks to C, I and TB

Factors that change C, I, G, TB will shift the $\boxed{\text{Aggregate Demand}}$

Here are some examples of such Shocks:

Shocks to C: Households consume more (or less) for any level of income

Example: increase in wealth from higher home prices or increase in savings due to a possible natural disaster

Shocks to I: Firms invest more (or less) for any given interest rate

Example: Technological discovery such that new and more profitable projects become available

Shocks to TB: Households consume more (or less) foreign goods relative to home goods

Example: Change in tastes towards foreign goods

→ We assume foreign variables are exogenous and given ⇒ Changes in those can be thought of as shocks (e.g. change in foreign interest rate)

As usual, any sudden increase (or decrease) in C, I, G, TB for the same level of output generates the same change in the Aggregate Demand

(and will imply shifts in its curve once represented in a plot)

Fiscal policy: when we allow changes in G and T these also represent a type of shock (that shift demand) that are induced by the government at their discretion

The Equilibrium in all markets: IS, LM, FX

Goods market equilibrium

We have functions for C, I, TB (and we know these are the possible types of goods we consider)

T, and G: exogenous

Fixed for now and change only at the discretion of the government and not by reacting to other changes in the model like the other variables (e.g., C, TB)

$CA = TB$ (given assumptions on $NFIA$, NUT)

Then:

$$\text{Demand of goods} = C + I + G + TB$$

$$\text{Supply of goods} = Y$$

In equilibrium:

$$\text{demand} = \text{supply}$$

That is:

$$Y = C + I + G + TB$$

In equilibrium

In terms of the functions we defined:

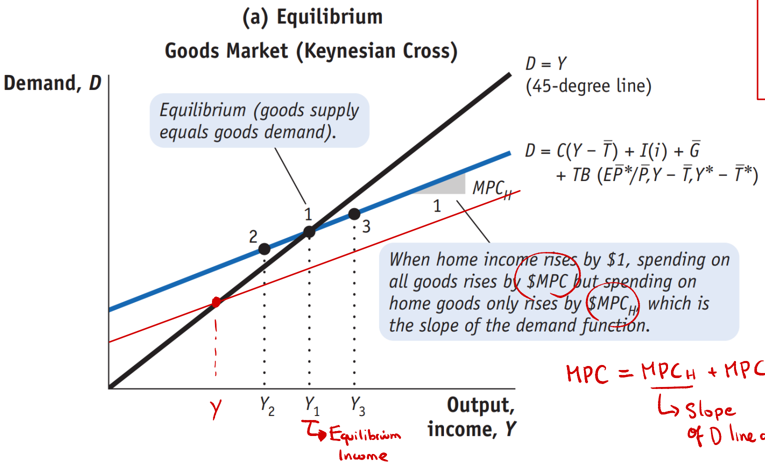
$$Y = C(Y - \bar{T}) + I(i) + \bar{G} + TB(E\bar{P}^*/\bar{P}, Y - \bar{T}, Y^* - \bar{Y}^*)$$

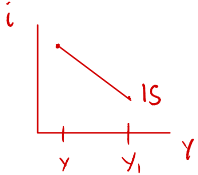
Keynesian Cross

We can do our typical representation of this equilibrium from previous macro courses: The Keynesian cross

Keynesian Cross: plot of Demand vs. Supply with equilibrium at intersection where Demand $=$ Supply

Figure: Goods Market (Equilibrium at intersection)





$MPC = \underbrace{MPC_H}_{} + MPC_F$

↳ slope of D line above

Slope of Demand

First, why is the slope positive?

Demand Slopes up $\longrightarrow$ see how each component grows (or not) with income

Income shows up in C and TB (i.e., $Y - \bar{T}$ in each function)

$\uparrow$ C by $MPC > 0$

$\downarrow$ TB though: Imports increase by $MPC_f \rightarrow$ Demand decreases by -MPC_f

Total effect on Demand: $MPC - MPC_f$

If more of the extra income goes to domestic goods than foreign goods: Demand increases

(this is usually the case … $MPC - MPC_f = MPC_h > 0$)

Second, notice the slope is lower than 1

Each extra dollar will increase demand **for home goods** less than a dollar and than MPC …some goes to imports

So actual increase is $\underline{MPC_h = MPC - MPC_f}$ which is lower than MPC that (with savings) already is lower than 1

(note: a slower slope than 1, i.e., of MPC_h implies a single intersection -or equilibrium- between supply and demand in the cross)

Equilbrium in Goods Market

The equilibrium output is described by $Y = C + I + G + TB$: Equilibrium

If actual output is *lower* than the equilibrium one $\longrightarrow$ Firms produce *more*

Shortage of production

If actual output is *higher* than the equilibrium one $\longrightarrow$ Firms produce *less*

Surplus of production

Eventually, the equilibrium and actual output coincide: $Y = D$ and $D = C + I + G + TB$ (the curves intercept)

Demand driven equilibrium: output adjusts to meet demand in the short-run (with sticky prices)

In the long-run prices are flexible and adjust to clear the market

In a nutshell:

SR: Adjustment via quantities

LR: Adjustment via prices

Shifting Demand

Private consumption increases after:

1. A decrease in taxes $\downarrow T$
2. Other factors affecting consumption but not income (e.g., tastes)

    That is, when we have a higher C for any level of Y (shifts up)

Investment increases after:

1. A decrease in i
2. Other factors driving up investment but not income (e.g., technological discovery)

    That is, when we have a higher I for any level of Y (shifts up)

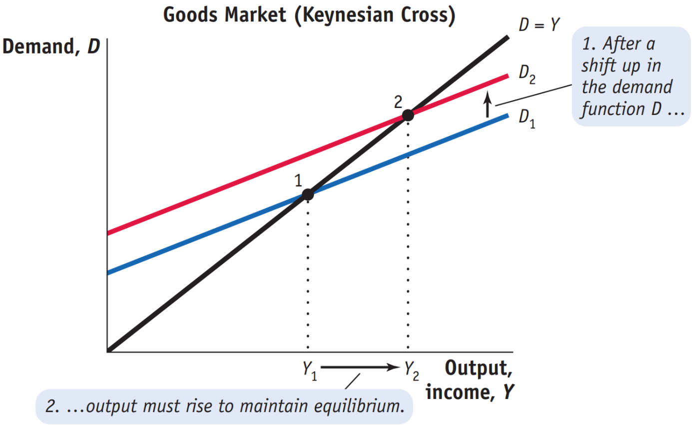
Trade balance increases after:

1. An increase in the Real ER: $\uparrow E$ (depreciation) (with sticky prices increase in E is the same as increase in RER)
2. An increase in P^* or a decrease in P
3. An increase in T^* or a decrease in T
4. Other factors affecting the TB but not the income

    That is, when we have a higher TB for any level of Y (shifts up)

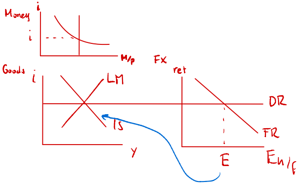
Goods market equilibrium: Increase in demand

Figure: Goods Market (Equilibrium at intersection)



Shift up (down): higher (lower) demand for any level of income

General Equilibrium



Three markets: Goods, FX (forex), Money

All of them should clear simultaneously (be in equilibrium)

We connect the markets with 2 extra plots:

- IS curve $\longrightarrow$ links goods and FX markets
- LM curve $\longrightarrow$ links goods and money markets

Let's derive each now, then we can put everything together later

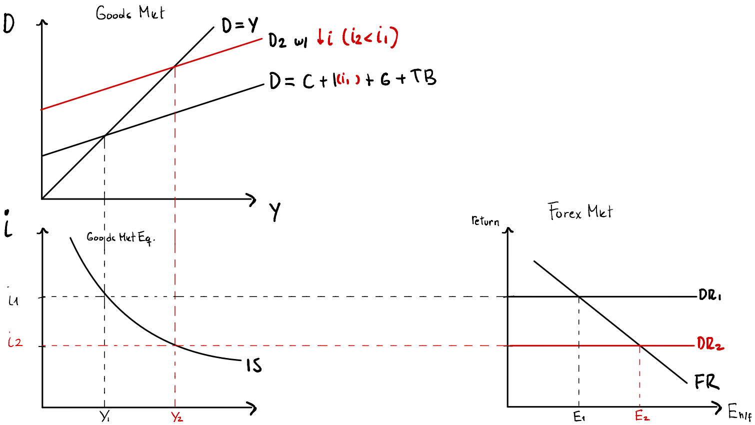
IS curve

Relates the goods market to the Forex market $\longrightarrow$ Link: interest rate i

Recap: In the goods market shows up via I, in the FX market shows up in UIP (DR and FR curves)

IS: represents all the $(i,\ Y)$ pairs that are consistent with the equilibrium in the goods (and Forex market)

Derived: by changing i and tracing out the corresponding Y



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Derived: by changing i and tracing out the corresponding Y

New result: (a decrease in rates) $\downarrow i$ stimulates economic activity **more** in Open Economies

- Closed economy effect on Investment works the same way
- But it also causes a ~~devaluation~~ and increases the trade balance (TB)

↳ depreciation

Closed Econ channel → works the same way

But New → TB reacts to i via E

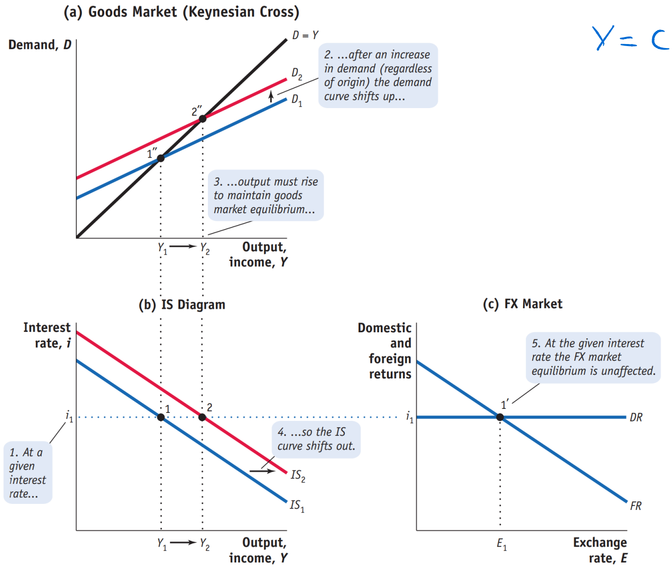
(via UIP)

IS curve slopes down:

$\downarrow i$ then $\uparrow I, \uparrow E_{h/f}$ (depreciation of ER) and $\uparrow$ TB ...from both effects: $\uparrow Y$

Shifting the IS curve

Figure: Shift in IS curve after an Increase in G



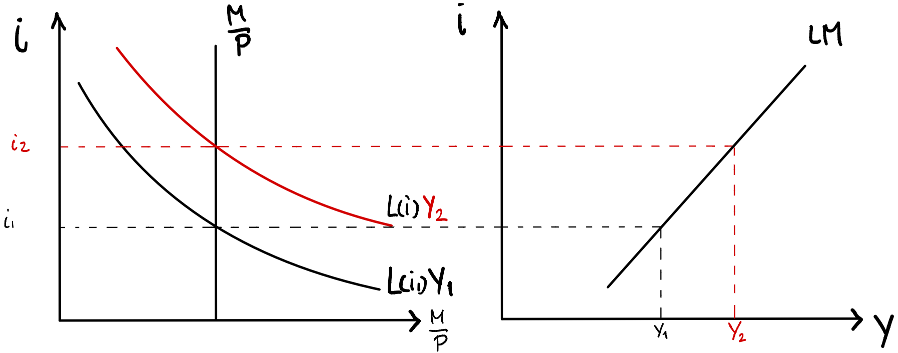
$Y = C + I + G + TB$

LM curve

Represents all the $(i, \ Y)$ pairs such that the money market is in equilibrium

Derived it by changing Y and tracing out corresponding i

(Note: Same setup as in a closed economy)



(Unlike the IS) the LM curve setup is the same as in a closed economy

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(Unlike the IS) the LM curve setup is the same as in a closed economy

the **LM** curve as an **upward sloping curve**:

If real output rises people demand more money, with money supply fixed interest rate rises: $\uparrow Y \longrightarrow \uparrow i$

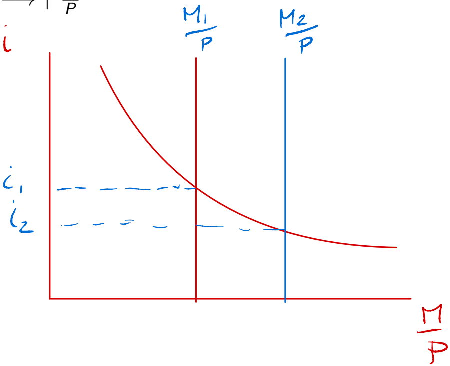
$\uparrow Y \nearrow$

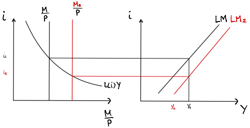
Shifting the LM curve

Increase in (nominal) money supply

Things that shift moeny demand down that are not Y

Example: increase in $M \longrightarrow \uparrow \frac{M}{P}$





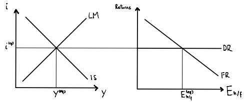
IS-LM-FX

Points along the IS curve: combinations of $(i, \; Y)$ where goods and FX market are in equilibrium

Points along the LM curve: combinations of $(i, \; Y)$ where money market is in equilibrium

Point shared by IS and LM (**intersections**) $\longrightarrow$ all 3 markets are in equilibrium

- Determining $i, \; Y, \; E$ equilibrium values



Summary

IS: Combinations of $(i,\ Y)$ such that goods and FX markets are in equilibrium

- $\downarrow T, \downarrow P$, or $\uparrow G, \uparrow i^*, \uparrow E^e, \uparrow P^*$ shift demand (up) and IS (right)
- Any change in $C(\dot{)}, I(\dot{)}$, or $TB(\dot{)}$ shifts demand, shifts IS

  i.e., important factors that are not Y

LM Combinations of $(i,\ Y)$ such that money market is in equilibrium

- $\uparrow M$ shifts LM down (or to the right)
- Any change in money demand function that shifts money demand down $\longrightarrow$ shifts LM down

  (i.e., changes in $L(i)$ but not in Y)

The Short Run IS-LM-FX model of an Open Economy

Outline

Before:

1. IS-LM-FX ties together equilibrium of Forex, money, and goods markets
2. IS-LM-FX will be our workshorse open economy macro model (for most topics ahead)

Now: IS-LM-FX and policy

1. Fiscal policy in an open economy
2. Monetary policy in an open economy
3. Effects of policy under different (ER) exchange rate regimes

IS-LM-FX recap

IS-LM intersection:

- Goods and FX market are in equilibrium (IS curve)
- Money market is in equilibrium (LM curve)

IS curve shifts:

- $\downarrow T, \downarrow P$, or $\uparrow G, \uparrow i^*, \uparrow E^e, \uparrow P^*$ shift demand (up) and IS (right)
- Any change in $C(\dot{)}$, $I(\dot{)}$, or $TB(\dot{)}$ shifts demand, shifts IS

  i.e., important factors that are not Y

LM curve shifts:

- $\uparrow M$ shifts LM down (or to the right)
- Any change in money demand function that shifts money demand down $\longrightarrow$ shifts LM down

  (i.e., changes in $L(i)$ but not in Y)

Policy in an Open Economy

Monetary and Fiscal policy

Assumptions

1. Policy changes are temporary: Do not change expectations (e.g. E^e, P^e)
2. Short-fun analysis: Prices are sticky
3. Free movement of capital: UIP holds
4. Variables in foreign cuntry are given (and fixed)

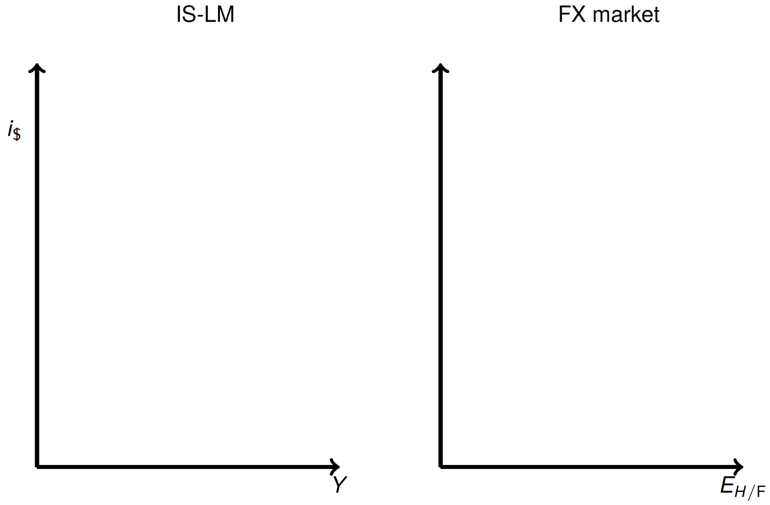
Temporary policies are a more interesting case than permanent ones

- They resemble better policymakers responding to cyclical conditions and shocks (more realistic)

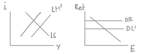
Start with flexible exchange rates then look at the Fixed ER regime case

We will see how the regime choice (constrains) changes the effects of the policies

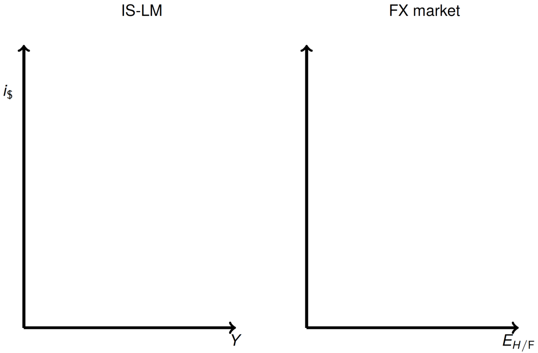
Initial Equilibrium in IS-LM-FX



Monetary policy: flexible exchange rate



Central bank (temporarily) expands money supply ($\uparrow M$) ... Does IS or LM shift? Where?



New with respect to closed economy IS-LM:

Drop in i shifts down DR curve (in FX market via UIP) ... depreciating the ER ($\uparrow E$)

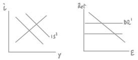
Takeaway: in closed economy Y rises due to $\uparrow I$, in open economies too but rises further due to $\uparrow$ TB

Food for thought: $\uparrow M$ increases Y as we saw ... this also increases *imports* which would lower TB

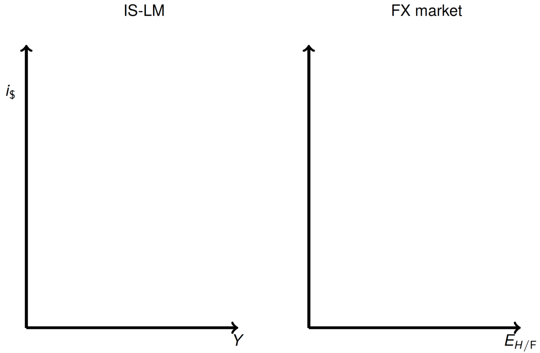
Then TB rises due to $\uparrow E$ and lowers due to $\uparrow$ imports ... we assume the overall effect on TB is positive

This is known as the Marshall Lerner effect (familiar?) (overall effect of depreciation on TB is positive, TB rises)

Fiscal Policy: flexible exchange rate



Government temporarily lowers taxes ($\downarrow T$) …Does IS or LM shift? Where?



IS shifts right due to higher $C(Y - T)$. This increases interest rate and decreases I $\longrightarrow$ Overall effect: Y increases

New with respect to closed economy IS-LM: higher i appreciates E lowering the trade balance $\longrightarrow \downarrow TB$
(i.e., the TB is partly crowded out)

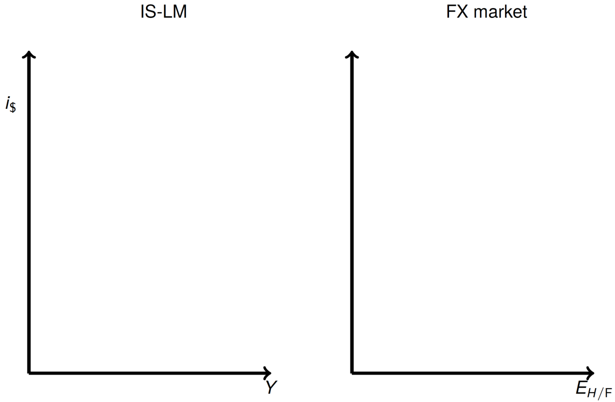
These extra effects (on I, TB) partly explain why with higher G, Y rises but less than proportionally (fiscal multiplier)

Monetary policy: fixed exchange rate

Not possible to conduct monetary policy $\longrightarrow$ trilemma in action

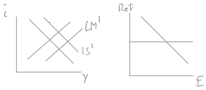
Fixed exchange rate & free capital mobility $\implies$ no monetary policy

Even if done: Monetary policy changes must be undone to keep i constant and the E fixed

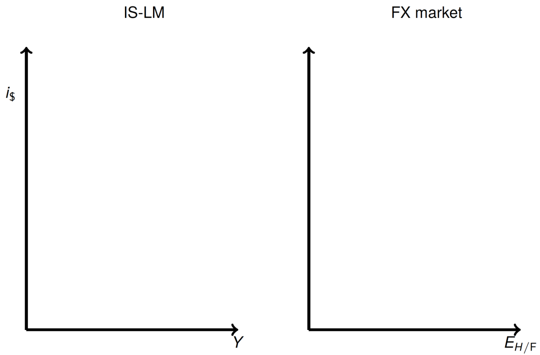


Monetary expansion would depreciate E which is not consistent with the peg regime . . . no change in equilibrium

Fiscal Policy: fixed exchange rate



Decrease in taxes, how to IS and LM shift? Does LM have to shift?



Interesting case: Fiscal policy becomes super effective in boosting Y (Y increases more than without a fixed ER)

Why? $\longrightarrow$ crowding out effects (on I, TB due to changes in i are removed)

Central bank policies: reduced to undoing effects of Fiscal Policy on i (to defend the peg)

Policy implementation

Are these policies effective (and this predictable) in practice?

They sure have practical effects, many in the direction we have discussed ... but sometimes the results of these policies may differ from what was planned

In real life there are factors that difficult having a swift implementation of these policies:

Policy constraints $\longrightarrow$ difficulty to raise funds for fiscal policy

Inside lag: time lag between shocks an policy actions

Outside lag: time lag between policy actions and effects

Incomplete Information: governments may not have full picture of the state of the economy in time

Long horizon plans: agents may act based on long investment/consumption plans and base decisions on expectations and not on temporary ER, i changes

Incomplete RER to NER passthrough

Intermediate ER regimes (e.g. managed floats)

Weak link between ER and TB: Trade costs in trade (that were assumed 0) and J curve effects
(that coupled with trade costs may even lead to contrary -to the expected- response of TB to ER movements)

Summary

Responses to Policy Shocks in the IS-LM-FX Model

Exchange Rate Regime	Policy	Impact on: i	E	I	TB	Y
Floating	Monetary expansion	↓	↑	↑	↑?	↑
	Fiscal expansion	↑	↓	↓	↓	↑
Fixed	Monetary expansion	0	0	0	0	0
	Fiscal expansion	0	0	0	↓	↑

Effects in Open Economies:

Additional to usual (closed economy) effects we get in IS-LM: must account by movements in ER & Trade Balance

Changes in i generated by policies lead to changes in the $E_{h/f}$ and TB that add to the overall effect on Output Y

Policy effects depend on the FX regime:

Counterbalancing effect on expansionary policies **if they imply a higher interest rate**:

They prompt a crowding out of Investment and a ER appreciation a with lower TB

With Fixed ER regime: the crowding out effects are removed $\longrightarrow$ policy makes sure i does not change

This makes the expansionary fiscal policies <u>more effective</u> . . . At what cost? $\longrightarrow$ cannot conduct monetary policy