[SQUEAKING]

[RUSTLING]

[CLICKING]

RICARDO CABALLERO: The main topic in this part is really open economy. And so we extended the IS-LM model. We did not bring in-- we again shut down price changes, so we said price is completely fixed. No Phillips curve here. So we expanded the IS-LM model to add this open economy dimension.

And so we start from the same aggregate demand function that we had in closed economy-- consumption plus investment plus go in expenditure-- but now we have to draw a distinction between demand by domestic households, companies, and the government, and the demand for domestically-produced goods.

And so z is the demand for domestically-produced goods, which is equal to demand plus the demand that foreigners have for the goods produced at home minus the imports, that part of that expenditure that is going to imports. That means goods produced by other countries.

And so the new behavioral functions here were the export function and the import function export. Is increasing in foreign output. More income abroad will lead to more imports by them, which means more export for home. And it's decreasing with respect to the exchange rate. Real exchange rate and nominal exchange rate will be the same here since we have fully sticky prices.

But if the real exchange rate appreciates, that means domestic goods are more expensive. It means exports are less. Foreigners are going to buy less of our goods.

Conversely for imports, it's like the exports of the other country, means that if domestic output goes up, then there will be more purchases of foreign goods. And if the exchange rate appreciate, means also that foreign goods are cheaper for us, and therefore we import more. OK. So positive.

So those were the two new behavioral functions in the goods market expanded to include an open economy. And that had implications for the diagram that we had in lecture three or so to determine equilibrium output.

We started from the same demand we had in closed economy. Then we had to subtract imports, and that shifts things down because now it's part of the domestic demand that is going to foreign goods, not to domestic goods. But it also rotates the curve because the higher is domestic income, the more the imports that we do from the rest of the world.

Now to that we have to add the exports, which are not a function of domestic output. That's a parallel shift with respect to this curve. No. We go up. And that gives us the zz curve, which is what we call the demand for domestically-produced goods.

Now notice that the distance between the demand for domestically-produced goods and the domestic demand for goods is the net export, so the distance between zz and dd is the net exports. So this point here, for example, the zz is higher than dd, which means that our exports are greater than our imports, and that's the reason you have a trade surplus.

At this point they're the same, and that's the reason the trade account is balanced, but over here, imports exceed exports. And that's the reason we have a trade deficit.

I'm going to go very quickly, so you're in charge of stopping me. I'm not going to ask you questions. Just stop me if there's something that you need clarification.

OK, so that's what's the demand for domestically-produced goods. Now we're going to determine equilibrium output in this open economy context, and that means aggregate demand has to be equal-- aggregate demand for domestically-produced goods has to be equal to output, and that's what we do with the 45-degree line here.

And so where the 45-degree line intersect with this zz curve, that's our equilibrium output. Now it happens that in this example, that leads to a trade deficit. But there is nothing here, so we still determine the equilibrium output up here, and then we read in this curve, bottom curve, what is the implication for the trade deficit or surplus.

But the equilibrium condition, important is that domestically-produced output has to be equal to the demand for domestically-produced goods. Not for total demand. It's demand for domestically-produced goods. Because this is a Keynesian model in which output is aggregate demand determined. But it has to be aggregate demand for the things you're producing, not aggregate demand for all goods around the world. OK. Good.

So then we did some experiments. We said, suppose what happens in this open economy context if we increase government expenditure. The curve will shift up in exactly the same way as in the closed economy.

The difference will be in the multiplier though, because as output goes up as a result of the expansionary aggregate demand, that also means that domestic income will go up, and that means that imports will go up, and thus demand will go for foreign goods. And that's the reason this zz curve has a lower multiplier. It's flatter than the dd curve.

Still if we start, for example, with a trade balance, since imports are going to increase as a result of this expansionary fiscal policy, we're going to end up with a trade deficit. And that's the reason the response of output is less than closed economies, because part of that goes to foreign goods.

Conversely, if this other country that is doing an expansionary fiscal policy or something that leads to higher output abroad, y star, that's also expansionary for home because the export function goes up, and that leads to an increase in output, still with lower multiplier because part of that increase in domestic output will go to imports.

But in this case, unlike the other ones, actually the trade balance improves because it's being pulled by exports. And so at impact we get a big increase in exports, which is the driver of increase for demand for domestically-produced goods. And then as income goes up, we do some of that, but you end up with higher-- better trade surpluses than in the case in which you induce the expansion in aggregate demand.

Then the last step there was to look at the role of the exchange rate. And what we said is we're going to make some assumptions that I promise you, and I now read the quiz so I guarantee you all of this promise-- nothing weird will happen, meaning if our goods gets more expensive, that means that net exports will be worse.

And for two reasons. For at least one reason, but it could be two. If the exchange rate goes up, then there is going to be less exports at any given level of foreign income. That will worsen the net export. And then we're going to tend to import more.

Now that will be partially offset for the fact that you can buy more with the same amount of dollars, but we said we're going to impose conditions such that the positive-- the negative effect of an appreciation on net exports always dominates. And again, in your quiz you're going to have a situation like that, and that will be the case. So don't think that we're trying to trick you or anything. This will hold.

The point of this being that depreciating your currency, making your goods less expensive will produce a response equivalent to what you get here out of an increase in y star. That's exports will go up, and you're going to get all this shift. Net export function will go up. That will increase aggregate demand and so on. So that's the kind of things that countries want to do typically when they're in a recession and so on.

Then that was an introduction to the most important lecture in this part of the course, which is the Mundell-Fleming model. And I promise you that you would get 70% at least in the quiz, and I already read the quiz, so I tell you there is at least 70% of your points have to do with this model, so you better understand it very well.

You do every single comparative statics that you can imagine with this model, and then you'll get 70% at least. I think you get 73% actually, but that's the-- so what's this? The Mundell-Fleming model is simply what I just showed you. It's the goods market equilibrium but with an endogenous exchange rate.

And so we rewrote and said, since we're assuming completely sticky prices, we can replace the real exchange rate by the nominal exchange rate, but now we're going to endogenize the exchange rate. And for that we're going to use the uncovered interest parity condition. This is a condition you should understand very well as well.

So that tells you essentially that the expected return of the two bonds, the bonds issued in foreign currency and domestic currency, have to be the same. The expected return have to be the same. And this condition ensures that, because if a country, for example, if the domestic interest rate is higher than the international interest rate, you need to expect a depreciation of the current currency, otherwise the expected return would not be the same.

And that's the reason when we add the assumption that the expected exchange is fixed at least temporarily, then an increase in the interest rate leads to an appreciation of the exchange rate. Why? Because if the exchange rate appreciates but the expected exchange rate stays put, that means the expected appreciation will have to be undone, and that means that leads to an expected depreciation.

So that's very important. So and here you have therefore you need to understand this, know that for a given expectation of the exchange rate, an increase in domestic interest rate appreciates the domestic currency, and an increase in the foreign interest rate without us matching it will lead to a depreciation of the domestic currency. So that's what you have there. That's important.

Now notice that if the expected exchange rate goes up and the interest rates do not change, then the current exchange rate has to go up. Because if it didn't, then you would have an expected capital gain out of the currency and expected appreciation, and that would add to the expected return of owning domestic bonds. OK, good.

So we characterize that interest parity condition as follows. We said, this here, we are plotting the domestic interest rate. Here we're plotting the current exchange rate. And we are marking in this picture-- this is a curve that traces the UIP and coverage by the condition.

And naturally when the domestic interest rate is equal to the International interest rate, then it has to be the case that the exchange rate is at the same level as the expected exchange rate. If that is equal to that, so if we're here, then we know that the point in that curve is that in which the exchange rate is equal to the expected exchange rate. That's what we have.

Good. So you should understand this curve and know what moves it. Here it's very clear what moves it, no? There are two things that can move this curve here. One is a change in i star, the other one is a change in expected exchange rate.

What happens if the i star goes up? You know that the UIP will shift, but you do know that the point equivalent to that, that is one in which exchange rate is equal to expected exchange rate, will have to have a higher domestic interest rate. Because if I'm bringing this up and I want to still look at the point in which e is equal to the expected exchange rate, then I have to move i up by the same amount.

And so I know that this curve, when i star goes up, this curve moves up or to the left. You pick which way you analyze. OK.

Now what about the expected exchange rate? If the expected exchange rate goes up and the international interest rate hasn't gone up, so if the expected exchange rate moves to the right and the domestic interest doesn't go up, then that means that the current exchange rate will have to also go up.

So that means if this goes up, then at an interest rate equal to the international interest rate, so let's look in this direction, then we have a point around here. If that wasn't the case, then you would be expecting an appreciation, and then again, it would be inconsistent with the UIP.

Then we put things together. So what we did is we use the UIP to replace the exchange rate there, and now we get this expression in the net export function. Now the LM is exactly the same as before. The central bank sets the interest rate. Here I'm writing it in terms of the nominal interest rate. I think in the quiz we wrote it in terms of the real interest rate, but it's the same because prices are fixed, so real and nominal interest rates are exactly the same. Yeah.

AUDIENCE: Is the x axis the expected exchange rate?

RICARDO CABALLERO: No. It's the actual exchange rate. The expected exchange rate is in this curve here. That is a parameter. This happens to be a value of the current exchange equal to the expected exchange rate, which is convenient to plot because that's also when the domestic interest rate, which is what I'm putting here, is equal to international interest rate. That's all I'm saying.

And then if you shift this to the right, exchange rate up, the expected exchange rate up, then I know that a new point in this curve has to have a higher current exchange rate. So that I know. I know that the equivalent to this point A is going to be to the right.

If you lower the foreign interest rate, then what I know is that exactly, that the point at which exchange rate is equal to the expected exchange rate has to have a lower domestic interest rate. So that means that I know that this point A will be around here, which is like a shift to the right.

Anyway, so as I was saying, nominal and real interest rates are the same. I think in the quiz we wrote r there, but it's the same. Same model.

So now you see that interest rates have two effects. One is the traditional effect, affects investment, but it also affects the exchange rate. So an increase in the domestic interest rate now will be doubly contractionary in the sense that we lower domestic investment. That reduces aggregate demand.

But at the same time, it will also appreciate the exchange rate, and therefore it will reduce net exports. We're going to import more and export less, and that's also going to reduce aggregate demand. So those are the two effects.

So that's the contribution of all this exchange rate block to our IS-LM framework. Mundell-Fleming is simply IS-LM plus a UIP condition and a net export function. That's it.

So we put out now the two things together, sort of a standard IS-LM, now with different slope and so on because we have this net export function and we have more parameter, we have y star, i star, and things like that, and then we have the UIP there.

And then we did a few experiments. Said suppose that now you have an expansionary monetary policy. So an expansionary monetary policy as before with slightly different slopes and so on because of the net export function will lower equilibrium output.

And it will lower it for two reasons. As I said before, it will lower it because investment will decline but also because higher interest rate means an appreciation of the exchange rate today because you have to expect a depreciation now in the next period. And that means also less net exports. So the interest rate is contractionary for two different reasons here. Is that clear? Yeah.

Raised interest rate. Raised interest rates will lower aggregate demand for the standard reason, but on top of that, we're going to get an appreciation of the exchange rate, which also reduces net exports.

What about an increase in government expenditure? It's the same as before, and nothing changes relative to before except for the fact that we have a lower multiplier. But it's still the case that it's expansionary, but it doesn't affect the interest rate, it doesn't affect the exchange rate or anything like that. Again, it's less expansionary than closed economy because part of that energy will go to imports.

Then I went to this diagram, and I played with this diagram here and said, suppose that the expected exchange rate goes up, then which curves change? And the first one that changes is this one. This one moves to the right, so you get an appreciation today. And that also means that this curve here, that, yes, will shift to the left.

If expected change goes up and you don't change monetary policy, that means interest rate will go up. Sorry. And you don't change monetary policy, that means the current exchange rate will appreciate. That will reduce net exports, and that's a shift in this space. That's a shift in the yes to the left.

This is a parameter. These two things are parameters now in the IS-LM diagram.

What about for an output going down? That doesn't affect the UIP condition, but it does affect net exports, so that moves IS to the left. And the last thing we did was an increase in i star. And an increase in i star, what it does is at the same interest rate, then you know that you need a depreciation of the currency today because that will lead to an expected appreciation, so that means that this UIP curve moves to the left and the IS curve moves to the right.

And increasing the interest rate taken as given foreign output. If foreign output also changes, then you have to look at the combination of the two things. But taking foreign output as given, then this curve will shift to the left and that will move the IS to the right because the exchanges will depreciate.

It said sometimes countries choose to fix exchange rates. And when you fix an exchange rate, and if it's a credible exchange rate, then the expected exchange is equal to the actual exchange rate and equal to some constant, then that implies immediately that the domestic interest rate has to be equal to the international interest rate.

So if you fix your exchange rate to someone else, then you give up your monetary policy. The monetary policy is run by a different country. OK, good.

So that's a very important lecture. Play with it, please. Then we look more carefully at different exchange rate regimes and the effectiveness of policy within each of these regimes, the flexible exchange rate system, which is the one we were discussing before, you get sort of-- if a country is in a recession, you can use fiscal policy. I showed you that before. It works well.

And you can also use expansionary monetary policy, which will be very successful for two reasons. One, the traditional one, but the second reason is that it will depreciate your currency. OK, good.

Now then suppose that you had a country that is also in a recession but you have a fixed exchange rate. Then you still can use fiscal policy. There is nothing against that. But you cannot use the expansionary monetary policy. So that's a limitation of fixed exchange rate, that you lose an important tool.

Another problem that can arise with fixed exchange rates is speculative attacks on the currency. Sometimes the peg is not credible, and when the peg is not credible, you can imagine that-- suppose that people expect your currency to depreciate, so expect the exchange rate goes down, and suppose that you do want to keep your peg today, that's what typically happens. Somebody speculates against your peg, but the central bank resists that for a while.

But the only way you can resist that, short of closing the capital account and doing all sorts of things there, but you haven't learned about those, so don't worry. The only tool you have here to defend the speculative attack on your currency that is for the exchanging note to depreciate today is by raising interest rates. So the defense of an exchange rate causes a recession at home. That's another problem that flexible exchange rate have.

And the deal seems pretty obvious that you don't want to have a fixed exchange rate. And I said, be careful because flexible exchange rates are also not a panacea. You may get lots of volatility in the exchange rate because the role of expectations is very important.

And anyways, this looks complicated, but it's essentially what we did later on when we price equity and things like that. We use the same sort of iterated substitutions and things. This was just meant to say that in a flexible exchange rate, once you endogenize expected exchange rate, you don't take it as a constant, it gets to be very complicated because effectively the exchange rate is pinned down by the expectations of infinite horizon of interest rate at home and abroad.

So there's lots of space for creativity and moving things around. And that's the reason exchanges can be very volatile. OK, good.

So anyways, so all that, that was it for Mundell-Fleming plus. Any question about that? Because now I'm going to move to the next part.

OK, so then the next step was to look at asset prices really and/or valuations of assets in general that have cash flows in the future or an exchange that's a little bit like that, by the way. We talk a lot about current events.

But the key thing was this. We said, OK, many things, many financial or real assets, actually, or even your human wealth, we'll discuss later on, you are receiving some income today, but you're also expecting to receive income in the future. And this part was about how do we value those things that we receive in the future, those cash flows that come in the future.

And so we developed this concept of a expected present discounted value. And we said, very natural way of bringing dollars received in the future to the present is to discount them by the interest rate between now and then.

And the reason, the logic behind that is because if you give me $1 today, I can do a lot more than if you give me $1 five years from now because I can invest the dollar today and earn the interest rate return up to five years from now. So $1 today is worth a lot more than $1 five years from now, therefore $1 five years from now is worth a lot less than $1 today. How much less? 1 over 1 plus the interest rate over that period, which is-- OK.

So that's what we did. Then I show you a general cash flow. This is an asset that gives a cash flow zt at the beginning of this period. zt plus 1 at the beginning of the next one or at the end of this one, something like that. This one you don't need to discount. That one you do need to discount because you're not receiving it now, you're receiving it a year from now.

This one, it's two years from now. You need to discount it more because it's two years that you could be earning an interest rate and so on and so forth. This formula you need to understand.

And I said, that's if you know the future. If you don't know the future, then you just replace the things you don't know for their expected value. That's what you say. And that's the approximation. In reality, if you were to do this formally, it's a little more complicated. But for this course, that's all that you do.

And then I look at some particular cases. This is a case, the same case, but one in which the interest rate is constant. Suppose that you expect the interest rate to be constant, then it's a little simpler expression, because rather than getting this product of 1 plus 1 the interest rates at different times, you get just powers of 1 plus i.

Then another one that is simpler obviously is one in which all these expected payments are constant and so on.

And then even simpler, if the interest rate is constant and the payment is constant, you get some simple formulas like that. Simpler formulas.

And then cases in which asset lives forever of that kind and that's a value, if you don't pay for-- if you don't receive the first cash flow now but you receive it at the beginning of next year or at the end of this one, then it gets even simpler like that. And you are going to get a question of this kind in which you are going to be asked to compare two different assets that have different profiles of cash flows, and you're going to have to compare between those two.

Then we talk about bonds and bond yields. And essentially we use expected present discounted value formula just for bonds. And bonds have a very particular form, profile of payment. Typically some coupons and some final payment, which we call it the face value of the bond or something like that.

And we said a very important concept in bonds is maturity. And maturity is the date, the number of years till the last payment on that bond. Doesn't matter whether you receive lots of little coupons along the way. And one final payment, whether you receive no payment whatsoever until the last day, that doesn't matter. The maturity of a bond is the date, the number of years till the last time, your last payment.

So we give some examples. There's a bond that pays nothing now but pays $100 one year from now. Has a price. It's a discounted value of $100 for one year divided by 1 plus the one year interest rate at time t. A bond that pays nothing up to two years and then after two years pays $100, then that's the value, the price of that bond. It's $100 discounted by that.

And then we look at arbitrage, which says suppose you hold a bond that you're considering investing your money for one year, but you have two options. One is to buy a one-year bond. The alternative is to buy a two-year bond now and sell it at the end of the year. Those two strategies should give you more or less the same return.

Well, if you buy a one-year bond, you're going to get 1 plus i1t at the end of the year. If you go through the two-year bond strategy, then you're going to pay this today but you expect to receive the price of a one-year bond one year from now.

And we said these two things have to be equal. More or less equal. Again, we're not adding risk to these things. If there's no risk consideration of agents at risk neutral, then these two things have to be equal.

That allows you to solve for the price of a two-year bond as expected price of a one-year bond one year from now divided by 1 plus the interest rate, but the expected price of a one-year bond one year from now is going to be like a one-year bond but one year from now, so it's 100 divided by 1 plus i1t plus 1 expected value. I can stick that in there, and I get exactly the same expression. So these are two different ways of pricing a bond or any other asset actually.

And then we define the yield to maturity. So that's an important concept. Yield to maturity is a constant rate that gives you the current price of the bond. So we already determined the price of a two-year bond is that. And now I'm saying, suppose that-- let me look for a rate that is the same in both periods that gives me the same price. And that's the reason I have a subscript 2 here at time t.

So what is the rate that, if I put a constant rate, so I have 1 plus i2t times 1 plus i2t gives me exactly the same price as the one we already determined. And that's what we call the yield to maturity or the yield or the end-- in this case, would be a two-year rate. If you hear, what is a two-year rate, it's that.

And so we know what this price is, which is equal to that, thus this expression there. So the whole trick here is to find the two-year rate at time t that gives you exactly the same value. That means obviously since 100 is equal to 100, it means to find the i to t that gives you this equal to that. Would you say it's approximate, implies that approximately a two-year rate is like an average of the two one-year rates. But this concept, you should know what it is.

I said there are two forms of risk in a bond. One type of risk is the full risk. What if the issuer of the bond doesn't pay you? Now there's a huge issue with the US debt ceiling, because if somehow they don't fix that, there will be a default on some treasury bonds. Let's hope that it doesn't happen.

But that's default risk, is that whoever issued the debt, at the time in which it should be paying you a coupon or the principal, the face value, it doesn't pay you. That's default risk. And typically, US Treasury bonds don't have that risk, so nobody worries about that. At this moment, the default risk price in US bonds for one-month bonds is higher than that of Mexico and the bonds in Mexico or Brazil. That tells you the kind of things we have.

But in any event, so this is a temporary default risk. Nobody expects in the US that this will not be eventually repaid. But you can cause a big mess by just delaying a coupon payment when these coupons are huge. And so that's what's leading to all this concern.

But in any event, that's one type of risk. But we didn't look at that type of risk a lot. Corporate bonds have a lot of that risk, but we didn't look at that kind of risk. We looked at another kind of risk, which is price risk. If you invest in your one-year bond, there is no price risk, you're going to get your coupon, your face value of $100 at the end of the year. That's it.

If you go through a two-year strategy, there is a risk there because you don't know exactly what the price of the one-year bond will be one year from now, and that's a risk there. We are not looking at what risk-averse investors do and so on, but in reality, there is such a risk.

And just the way we model that is we said, then if I'm going to go through the two-year bond route for a one-year investment, then I don't have to set this equal to the return I get in the short bond, the one-year bond. I have to add an extra risk premium. And then we write to this formula using the same steps.

We said, well the two-year rate is really the average of the expected one-year rate plus a premium. And we call that actually the term premium. You're more likely to face a question about the top of the slide than the bottom of the slide, but I don't remember fully.

Stock prices and present value. It's the same sort of idea. The only difference is that the equities do not have maturity. Stocks do not have maturity. In principle, a company would last forever. And so there is no maturity. And there is also the commitment of-- the coupons are a lot shakier in the sense that, yeah, the company is likely to give dividends, they may announce the dividend policy, but it's not a commitment.

Regional banks now are not giving any dividend because they want to preserve the capital. They could, but they're not because they want to build capital just to be more resilient to any further bad news.

But anyway, so equity, that means that you always have this future price floating around, and you can keep substituting this multiple times. And essentially, you get to an expression that says, look, the price of equity is really the expected present discounted value of the dividends, and that includes lots of uncertainty because you don't know exactly what the interest rate will be in that period and so on. And there is always a remaining term out there which also causes a lot of trouble.

In practice, assets, equities move a lot more than what you can justify with respect to the present value of dividends. There's a lot of volatility. There are bubbles. There are all sorts of things. I told you the story of Newton and so on.

So this formula for the bonds, those formulas are great. For equity you're going to be pretty far off on actual prices if you use this type of formula. Still people call this the fundamental value of equity. And then the rest is sort of more speculative. But the point is that the speculative component moves a lot. It's responsible for a very large share of the volatility in asset-- in equity prices. In any event, I'm not going to ask you about this kind of stuff. Yeah.

AUDIENCE: So that final equation on the slide, there is no expression for qt.

RICARDO CABALLERO: It's right here.

AUDIENCE: Oh, OK.

RICARDO CABALLERO: It keeps going forever. It doesn't stop. Yeah. It just discounted more and more and more, so you would expect it to be less and less important. But if the thing is blowing up, then it may dominate the heavier and heavier discounting because it's further out in the future. And that's the way you create theories of bubbles. You can even come up with rational bubbles in that way, but again, that's for a different course.

What else? Then we look at what is the effect of an expansionary monetary policy on asset prices. And we said, obviously it's going to, if you lower interest rates, that's going to increase the value of any asset that pays in the future returns. And so it is typically the case that expansionary monetary policy will lead to an appreciation of all assets.

Most assets, but certainly bonds will go up directly because that's where the interest rate has a maximum, the clearest effect, but it's also the case that it tends to be bullish for equity as well. It's got interest rate.

A lot of the response of equity to news has to do with the expected behavior of the fed in the future. Do you think that this will lead them to increase interest rates or to lower interest rates and things of that kind. But again, I think that's a little too complicated for you for now.

It said, what is the effect of an increase in consumer spending on asset prices? Well, that depends. It's clear that if consumers become more bullish, that's going to tend to lead to more cash flows for the firms, so equity at least will go up. Bonds no, because the coupon is set, fixed, doesn't depend on whether the economy is doing better or worse. I'm assuming there is no default risk.

But it depends a lot of what you expect the fed to do. If you think that this is going to trigger a fed hike, then it's bad news for bonds because the bonds do not benefit from the extra economic activity, and they get hurt by higher interest rates. So it depends a lot on what you anticipate the fed to do or not. But again, I think this is a bit more complicated than what you need to know.

OK, the last step was to bring expectations into the IS-LM model. I said the model we discussed through the course on the IS-LM except for the part where we put the exchange rate, where we had to think about the future exchange rates and things like that. It really overweighed the present.

In reality, expectations matter a lot for consumers' decisions, for firms' decisions, and so on. Probably matters even more than the future-- than the present.

And so what we did is we expanded the IS-LM to include expectations, which is where consumers not only worry about disposable income-- this part will show up in your test, so you should understand what the IS-LM model is and do the comparative statics that corresponds to this model.

So what we did here, it says, consumers not only worry about the current disposable income, they also worry about the income they receive in the future through financial assets, financial wealth, or through their future labor income. That's what we call human wealth. But the point is that expectations about the future matter for consumption.

In the first part of the course we summarize all that in that little parameter c0. We said consumers can be bullish or not. A lot of what happens here is what shifts c0 in the first part of the course.

And this also highlights an important concept, which is typically if you expect something to have only a temporary transitory consequence, it will move consumption little relative to when you expect that change to be permanent. So you expect current income to be up, but future income to go back to a lower level, that's not going to change current consumption a lot.

However, if you think there is a change that will increase consumers income permanently up, well that will increase not only this but also human wealth, and that will lead to a much larger response of consumption.

We did more or less the same for investment. Obviously what matters for investment is future cash flows. And there we talk about the concept of depreciation. But really was this expected present discounted value of the cash flow generated by an extra unit of capital. So expected present discounted value formula.

So in the first part of the course, we just look at an investment function that has output here, and then we have an interest rate here, where now we have something that is more complicated. It has future output, which as a proxy for future cash flows but also current and future interest rates because those affect the value of those future cash flows in terms of today's dollars.

And we put all of this together, and we ended up with an expanded aggregate demand in which we had the same parameters as we had when we did the static model without expectations, but now we get sort of the same things repeated here one year ahead because it matters not only for aggregate demand, not only the income that consumers are receiving today or the sales that firms are making today, but also what they expect to have next year.

It matters what the taxes they are paying today but also what they expect to pay in the future. The interest rate matters not only today but also what they expect the interest rate to be in the future and so on.

So the bottom line is that if we now look at the IS-LM model, now we have lots of more parameters. All these things that happen in the future are new parameters. I said notice that also this curve now is a lot steeper. Why is that? Well because if you change the interest rate today without changing the interest rate in the future, then that has a small effect.

And so I said now this IS becomes very steep, but the equivalent to what we did in the static model is a situation where you cut the interest rate today-- say the central bank cuts the interest rate today, but it also convinces the public that it will also keep the interest rate low in the next period.

That is not only you move along these [INAUDIBLE], but you also persuade the public that the interest rate will be lower in the future, that will shift IS to the right. And then therefore you're going to get a much larger kick out of monetary policy.

And monetary policy is a lot about forward guidance. It's that you cut interest rates today, but you're also telling, there is always a speech after they take the policy action which they talk about how they see interest rates going in the future and that. That's because you want to have maximum power.

If you just tell the markets, I'm going to change the interest rate for now and then nothing else, that's going to have a very limited impact. To have a large impact out of monetary policy, you have to convince them that you will also affect the interest rate path in the future.

Same sort of situation here. The other parameters is what happens if, for example, you expect future output to go up. That's going to shift IS to the right. That's yet another reason why convincing people that you're going to cut interest rates in the future as well, that you're going to keep them low in the future shift IS even more, because if you're going to keep the interest rate low in the future, that means probably that future output will be higher.

And since future output is higher, that increases human wealth, and that means consumption will tend to go up.

But do play with this. And again, it's important to have this distinction between the impact of temporary things, which is much smaller, and the impact of permanent things, which is bigger because it affects wealth.

Oh, that's an example. So monetary policy, again, that's just if you don't persuade the public that you're going to change the interest rate in the future, then it just a movement along, but if you also convince them that you remain sort of loose monetary conditions next year, then that effectively shifts the IS to the right for a variety of reasons, for two reasons at least, and that's much more expansionary.

The last thing we need is fiscal policy. I said fiscal policy today is contractionary. There is no doubt of that. But there are episodes, and I show you the Irish episode, in which actually may end up going the other way around, in which you cut expenditure today, which is contractionary, but you end up actually having an expansion.

But for that, the only way that can happen is that if somehow you affect expectations in a very significant way. So that's what I said. If you ever get sort of a strange correlate response to a policy announcement, it's probably because there has been a big effect on expectations.

So I showed you the case of Ireland because there's a case that was famous in which all the people talk about there was a fiscal deficit-- that it's a big drag in the economy, that it was going to be a big day of reckoning and that, and so on and so forth.

So once they dealt with it, sort of expectations, they realized that they could cut interest rates then, they could realize that also that this malaise in the economy was going to go away, so people became optimistic about the future and so on, and they end up with an expansion. That shows you how important expectations are.

So economic policy in general, the direct immediate effect is what we have been discussing throughout the course, but a lot of its power and even the sort of perverse or good synergies that you get out of them has to do with what you do with expectations. OK, good.