[SQUEAKING]

[RUSTLING]

[CLICKING]

RICARDO CABALLERO: But before I do that, before I get into the IS-LM model, let me spend a little time telling you what is going on in the US economy, as this will relate to the kind of things that we'll discuss later in this lecture. So what you see there is the path of net worth, so wealth, essentially, of households and nonprofit organizations, households primarily in the US. And what you can see is that there is a more or less steady trend. Obviously, in recessions, net wealth tends to decline.

And certainly, early on in the COVID recession, it declined very dramatically, because the price of equity, the price of houses, everything declined with the initial shock. But what you see after that is a dramatic rise in wealth in the US, and all around the world, but particularly, in the US. And what is behind that, well, there are two things that are behind that, but the main one is asset prices.

You have massive rallies in the equity market. The price of houses sort of skyrocketed everywhere, and so on. Last year, 2022, was a bad year for asset values. The equity market declined pretty sharply in the US.

But still, I mean, it's a small decline relative to the big buildup of wealth. Now, why do you think that, in this course, I would be talking about this at this point? What happens?

Remember, in this part of the course, we're trying to come up with a model of aggregate demand, and then, how aggregate demand reacts to policy. That's the name of the game in this part of the course. So if I tell you that wealth increases a lot, why do you think I'm telling you that?

Aggregate demand. Consumers will reach. They will tend to consume more. That will increase aggregate demand. So the point I'm highlighting to here is that there is a big force behind increasing aggregate demand, which is consumers feel richer.

By the way, something similar is happening in corporations, and investment is also pretty high because of that, real investment. The other source of increasing wealth, which is not as dramatic as the previous one, but it's very important, especially in lower income segments of the population which tend to have a higher propensity to consume is that incomes did not decline a lot during COVID. And in some cases, they even increased because of the large transfers that we saw from the government to individual households, especially lower income households.

And at the same time, there wasn't much to spend on. So that meant that the saving rate also went up a lot in the US during the COVID recession. So people save a lot more. That's sort of the average saving, household savings. This is by quarter, I think. No, monthly. But that's what we saw in the past.

Look at during the COVID recession. People save a lot more. And what you're seeing today is, obviously, they save a lot more. That's part of the increase in net worth is due to this. It's small relative to the amount of wealth we saw increase. But this was about-- this excess saving amounted to about $2.7, $2.8 trillion. So you get a sense of the order of magnitude.

And what is happening now is what people are desaving so now people are saving less than they used to because now, they have opportunity to spend the stuff on. And so that's where you see massive demand for travel, massive demand for restaurants, hotels, and stuff like that. Well, that has a lot to do with people have the money to do it. They haven't been able to do it for a while. So now, they're doing a lot of that.

Why would I be telling you this now in the course, in this part of the course? For the same reason I told you that net worth went a lot. I mean, people had the savings, and they're really willing to spend it. That puts lots of upward pressure on aggregate demand.

These pictures capture more or less the same. This captures very much what I said in the previous slide. You see the personal saving rate. That's the average. I don't remember, over-- oh, seven-year average.

And you see what happened during COVID. Big spike in the savings rate, and now, big decline in the saving rate, where saving rate is much lower than what normally is. And remember, the saving rate is your income minus your consumption. So if you're saving less, you're consuming more relative to your income. That's the way it works.

Obviously, there is lots of heterogeneity. Some people made a lot of money, some people didn't make a lot of money during COVID. Some people save a lot, some people didn't save a lot. And in fact, we do know that on the lower income segments, a lot of the excess saving is already gone. I mean, it accumulated early on, but they spent it also much earlier.

But what you're beginning to see in some of those segments is even though they don't have access savings, they're borrowing a lot. So now, you see credit card borrowing, which had declined a lot, and now, has increased quite a bit. And again, what do you borrow for? Well, for consumption. So that also funds additional consumption.

So for all these reasons, at this moment, the US economy, and many economies around the world, are what we call overheating. There's a lot of demand for the production, that capacity of the economy. And that translates-- the problem, say, well, what's wrong with that? Well, the problem is, something you don't understand at this part of the course, you understand but you don't have a model for, but you will have six lectures, more or less, from now is that leads to high inflation.

You don't know that, but intuition tells you that it's a lot of demand relative to supply. Well, prices tend to go up. That happens in micro, and it also happens in macro. We'll learn that later. But in any event, as a result of this, the US economy is overheating, and therefore, monetary policy has been very contractionary.

The Fed has been tightening interest rate to cool down the economy. So how does that happen? Well, that's the kind of things that we can answer with the IS-LM model. So the Fed is very IS-LM like. I mean, that's the way they think.

The model is richer. They have more equations, and so on. But they are thinking in terms of the mechanism that we're about to summarize in the IS-LM model.

So if you have an economy that has this problem, and you are in the central bank, you need to use monetary policy. Well, to understand how the thing works, you need the IS-LM model. That's a starting point. Then you can add bells and whistles. But your starting point is the model we're about to see.

Anyway, so what you see is what I was saying, is that all that wealth, all that excess saving, all that pent up demand, if you will, led to lots of-- led to a very-- an economy that's overheating. And you can see here what happened. I disentangled between consumption of goods and consumption of services.

Consumption of service is about 2/3 of consumption. Remember, we talked about that. And goods is about 1/3. What happens is the scales are different. This is for goods. That's for services.

But what you see here is that was a trend. So consumption in services was growing at a steady pace, then COVID came and collapsed. I mean, you couldn't go to a restaurant, you couldn't travel, couldn't do anything. So consumption in services collapsed.

And now, it has been recovering. And that recovery picked up pace last year, actually, in 2021, already picked up pace, and by now, we're above the trend. So service consumption that collapsed during COVID now has fully recovered.

While, at the same time, the capacity to produce in the service sector hasn't recovered equally. But we'll get to that after quiz 1. What happens to goods consumption? Well. Also initially collapsed, but then, well, people were bored at home. They couldn't do anything. They bought lots of gadgets and stuff like that.

So goods consumption went up very sharply during COVID, way above the trend, you see? There is COVID collapse, and then, people began to buy all sorts of gadgets. Now, it's slowing down. But still, if you look relative to trend, consumption of goods is way above what it would have been in the absence of this episode.

So the sum of the two things tells you that you have an economy with a lot of consumption. And that, at this moment, the Fed wants to cool down. It's too much for the economy to take. So the Fed wants to cool it down. And we're going to see how you do that.

OK, so now, let's get into this set of lectures. And please, stop me if there's anything that is unclear, because as I said, this is probably-- if I hear over the summer you have forgotten everything you have learned in this course, but you remember these two lectures well, I'll be happy. So stop me if you do.

In fact, normally, I have taught this lecture in one. I decided to try to slow it down as much as I can because, again, I think it's particularly important for this course, and for your stock of knowledge. So one of the main things we're going to be able to do with this model, as I've been saying, is we're going to be able to discuss the main macroeconomic policy tools, which are monetary policy-- monetary policy is main anti-cyclical tool, but we're also going to be able to understand fiscal policy. And fiscal policy is not exactly equivalent to monetary policy. It works through the mechanism that allows you to do things that are more targeted, transfer resources to a specific group of people, and so on.

And sometimes monetary policy is just not enough. And the COVID-19 initial recession was clearly a case of that, and you had to go all in, and we'll see what we did there. It was pretty dramatic as an intervention. The COVID-19 recession led probably to what-- no, not probably. Surely to the largest combined package in history of policy support in terms of monetary policy and fiscal policy.

After these two lectures you're going to get to understand essentially the joint determination of output and interest rate, and we're going to be able to study, as I said before, the impact of monetary and fiscal policy. And this framework that we're going to use to develop, to study this is what Hicks and Hansen initially called the IS-LM model. I already hinted that this was coming, but why do you think the name?

I notice that you separate IS from LM. Remember what we're trying to do here. We're trying to look at the joint determination of output and interest rate. That is, we're trying to determine at the joint equilibrium of goods markets and financial markets.

When we describe the equilibrium in the goods market, we said there is an alternative way of describing it. Remember, I said as an investment equal to savings-- I equal to S. So the IS part of the name comes from the part that has to do with equilibrium in the goods market. IS-- investment equal to savings.

And the LM part has to do-- remember, L was that component of aggregate demand we had in the financial markets. We look at equilibrium as aggregate demand-- sorry, demand for money equal to supply of money. Supply of money was M. Demand for money was y times L of I, and therefore the LM part. That's the reason.

That's a mnemonic for why this model is called the IS-LM. IS stands for the part that has to do with the equilibrium in the goods market. LM has to do with the part that has to do with the equilibrium in financial markets. This model is a model that combines those two equilibrium.

So we're going to be interested in points in which both markets are in equilibrium. That's the name of the game here.

So let's first develop the IS relation. And the IS relation is really going back to lecture three. We're going to go back to lecture three, use the same model we used in lecture three with one change. And that change is-- remember in lecture three, we worked a lot on our consumption. The only endogenous-- the only function we had was a consumption function, remember? And then all the rest we took as given-- government expenditure was given, investment was given. All that was given.

We're going to relax one of those here, and we're going to flesh out a little more this investment here, make it closer to what a realistic function is. Not a constant, obviously. It's not totally exogenous to equilibrium output and so on. In fact, we do know that real investment, this physical investment-- remember, what is this I? It's investment. This is purchase of goods and services by firms for the purpose of building capital-- equipment, structures, and stuff like that.

I saw in Piazza-- very quickly, I'm not into that, but I see more or less the flow-- that somebody asked, "should bonds be included in investment?" What is the answer? In that investment. I.

Should purchase of bonds be included in that investment? No. This is purchase of goods and services by firms, no? Capital, machines, stuff like that. The other thing, it's a financial investment. It's nothing to do with the goods market. It's something that has to do with the financial market, not with the goods market equilibrium.

So that investment is real investment. Again, purchase of capital, buildings for the purpose of production and stuff like that.

And this investment is a function of two things at least. The first one is activity. When output is high, sales are high, companies tend to invest more. They buy more equipment, they buy more buildings, they expand. So investment is an increasing function of output very much like consumption, remember, was an increasing function of output because income is increasing in output So it was an increasing function of output.

So these, we already had seen functions that looked like that, and we already know what it does to aggregate demand. It makes that curve steeper, remember? And it's the multiplier behind that. Investment gives you something similar there.

But there is a second component which is also present in consumption but is not as important as for investment, which is the interest rate. In particular, when the interest rate goes up for any given level of income or output, then investment goes down. Why do you think that's the case?

AUDIENCE: [INAUDIBLE].

RICARDO   Yes. Most of investment is funded with borrowing, and borrowing becomes more expensive so you don't do it.
CABALLERO: Even if you don't need to borrow, there's an opportunity cost of those funds. You can use it to build machines to produce or you can do something else like have an investment, financial investment.

So whether you borrow or not, if still the interest rate is higher, the opportunity costs of building factories is higher. And so that's the reason investment is decreasing with respect to the interest rate.

So now we go back to our equilibrium in the goods market, which we said production is whatever aggregate demand wants. So output is going to be equal to aggregate demand. Aggregate demand is the same old aggregate demand we had, except that now we flesh out what is inside that investment function there, which we have another function is increasing output like consumption was, but we also have something that is decreasing in the interest rate.

And so this is what we call the IS relation. And so the IS relation therefore has all the combinations of output and interest rate that are consistent with equilibrium in the goods market. Listen to what I said. I said the IS relation or IS curve has all the combinations of output and interest rate that are consistent with equilibrium in the goods market.

What about lecture three? We already had that, but interest rate played no role, so we found one point. We said there is one level of output which is consistent with equilibrium in the goods market. That's what we found. Now since we have an interest rate there, we have two variables for one curve, so we can trace a curve, which is not only one point.

We can trace a curve. And that's what we call the IS relation.

So I remember I told you when we look at the goods market equilibrium, remember this diagram because you're going to come back to it many times. And there you are. So remember when we look at the equilibrium in the goods market, we had something like that. I'm just making it curve rather than linear simply because I haven't specified the functional form of investment, but it doesn't matter, really. Make it linear.

But remember, that's the way we found equilibrium in the goods market. We have an aggregate demand, and it was increasing. The slope was positive because we had a marginal propensity to consume. That's the reason this was not flat, but upward sloping. And we found equilibrium output that way.

So this is lecture three. We're back in lecture three here but with two things, two differences. The first one is that this ZZ curve relative to the one we had in lecture three is a little steeper. Why is that?

Why is it that it's a little steeper than that-- by steeper, I mean if income goes up, then aggregate demand goes up by more than it used to go up.

AUDIENCE: Is it because investment is also not [INAUDIBLE]?

RICARDO CABALLERO: Exactly, because what made it upward sloping before was the marginal propensity to consume. But now there is also a marginal propensity to invest, which is also positive, and that's the reason it's a little steeper.

More interesting for this part of the lecture, though, for the construction of the IS curve is that it's a parameter that we have there in ZZ. What are the parameters we had before in that curve? We had things like government expenditure, taxes, the autonomous consumption. That's the kind of stuff that we had as parameters of that ZZ curve. By parameters I mean if we change those parameters, we shift that curve.

Now, for this particular ZZ we have an extra parameter, which is a very interesting. What is that? It's there, I think. It's the interest rate. That curve holds for some given interest rate. If I move the interest rate, I'm going to move this curve around. That's very important.

One of the parameters there, the star parameter I would say for this minute of the lecture, at least for this moment in the lecture, is the interest rate. I can find an equilibrium because I couldn't find an equilibrium in the goods market if you don't tell me what the interest rate is, because it's a curve.

Remember I told you, it's a relationship, the curve. So if I tell you what the interest rate is, then you can find the equilibrium in the goods market because you can fix this curve. That's for one given interest rate.

OK. Do you understand that? That's important. Yes? Those of you that are awake, you understand it or not? Not everyone is in the same page here. OK, good.

So what we're going to do next is construct the IS curve. And how are we going to-- remember, what I want to try to do is constructing the space of interest rate and output, a curve, which we're going to call the IS curve.

Here we have a point in that curve, because for one level of interest rate I found the equilibrium output. So to construct the curve, what I need to do is start moving the interest rate and see how the equilibrium output changes, and that will trace a curve. And that's going to be my IS curve or relationship. So let's do that. That's the construction of the IS curve.

So in the previous chart we found point A, So point A there is that point. There we are. We had some interest rate. This interest rate. Believe me, that was a parameter of the ZZ curve I showed you before. Gave us equilibrium output A. So that's a point in the IS because that's a combination of interest rate and output, which is consistent with the equilibrium in the goods market. That's a point in the IS. That's the definition of IS.

So now what I'm going to do to construct my IS is, OK, let me move the interest rate. Let me raise interest rate from I to I prime. OK, that's an increase in the interest rate. And now let me find what is the new equilibrium in the goods market for a given interest rate which is higher than the one I used to have. That amounts to shifting the ZZ curve down.

Why does increasing the interest rate shift the ZZ curve down, the aggregate demand down?

AUDIENCE: Because it makes borrowing lifetime.

RICARDO CABALLERO: It makes investment. The client-- exactly. Borrowers will expect, therefore investment declines. So that means for any given level of output, now aggregate demand is lower because investment is lower. And then you get the multiplier to do its trick, and therefore, you end up with a decline in output which is even larger than the initial decline in investment as a result of the increase in the interest rate. That's what a multiplier does.

So say interest rate increased by 100 basis points. That reduces investment by, say, $10 billion, and equilibrium output ends up falling by $15 billion because of the multiplier and so on. But the point is after I do all my convergence to this new lower equilibrium level of output, I have a second point in my IS curve, because that's a combination of a new interest rate, I prime, an output that is consistent with the equilibrium in the goods market.

How do I know that it's consistent with equilibrium in the goods market? Because I'm there. I'm crossing. 45-degree line, that means output equal to aggregate demand. That's equilibrium in the goods market.

And of course you can keep going and trace an entire curve. And all that you'll do is you'll change the interest rate. That will shift this curve. Then you do the multiplier and end up with a new equilibrium, and that's another point for your curve.

So is it clear how we constructed that curve? Very important. OK, good.

It's also very important to understand-- so why is it downward sloping? That's a question. Why is it downward sloping? What does it mean that it's downward sloping? That means that the combination of output and interest rate that are consistent when equilibrium output are negatively correlated, meaning I have a combination of high output and low interest rate-- it's consistent with [INAUDIBLE], or high interest rate and low output. That's what I find here.

But why is that? What is the logic of behind that? Or the mechanism. The way to think about that is exactly the way I did this experiment. It's to say, let me think what happens if I increase the interest rate and I keep the level of output where it was. So what happens if I increase the interest rate and I keep the level of output at the level it was? My claim is that that's not an equilibrium in the goods market. What is it?

So I'm saying suppose I increase the interest rate but I keep the output constant. So output is here, higher interest rate, aggregate demand is there. So what is the problem? My claim is that's not an equilibrium in the goods market. We're going to need a lower level of output to have an equilibrium in the goods market. That's the reason it's downward sloping.

But why is that not an equilibrium in the goods market? Or what is the nature of the disequilibrium in the goods market there? What do we have-- an excess demand, excess supply? Excess supply, meaning there isn't enough demand to support that supply, so supply has to fall in order to restore equilibrium in that market, in the goods market.

And since one drags the other one, it has to fall by a lot. That has to do with the slope of this curve.

But that's the reason is negatively. So that's the first thing you have to understand when you construct this curve. I know I'm going slowly, but it's important. Please try to understand-- another way of saying it-- when I change the equilibrium output along this IS curve by moving the interest rate around, what I'm doing is I'm moving along an IS curve.

So if the only reason why equilibrium output is changing is because I'm moving the interest rate, that's a movement along the IS curve. So I'm tracing points of the IS curve. Good. And I want to draw a contrast between these movements along the IS curve versus things that shift the Is curve.

For example, that. So suppose I increase taxes. I don't increase taxes. The government increases taxes. My claim is that the IS shift to the left. That is, for any given level of interest rate-- pick any interest you want. Say this one. You're going to have a lower equilibrium output consistent with that interest rate.

You have a lower equilibrium consistent with the same interest rate that has shifted the IS. It has to be a different IS.

And think that I can do that for any given [INAUDIBLE] event. I pick this one, but I could have picked that one. Would have been the same. I'm saying, if you increase taxes, that's going to lead to lower equilibrium output. So that means that for this higher level of taxes, I will have to trace a different IS curve. I can start moving the interest rate around, but I'm going to have a lower level of output for any given level of interest rate because I have higher taxes.

So how do I know that an increase in taxes will do this? Which diagram would you go to to try to understand this?

So let me ask it differently. How do I know that this stuff shift to the left? So I give you more open space. How do I know that this increase in taxes will shift this IS curve to the left? How would you go about thinking about that?

AUDIENCE: Well, I think there's more taxes than people [INAUDIBLE] --disposable income, so they're not going to spend as much money, and there'll be less outcome.

RICARDO CABALLERO: Their would be less aggregate demand, and less aggregate demand leads to less output because output is aggregate-demand determined. Exactly. That's what equilibrium in the goods market. So you can go back to this diagram. I could say ignore these labels here and say, for any given level of interest rate, pick any, if I increase taxes, I'm going to shift the ZZ curve down. So ignore this [INAUDIBLE].

Suppose that I fix the interest rate but I now change taxes, increase taxes. I'm going to do exactly the same here. I'm going to move this down. And it's going to be a different IS curve, though, because-- I shouldn't have used this diagram. Let me keep your answer. I should have put it on your diagram.

But it's lecture three. In lecture three we did see that an increase in taxes would lead to lower equilibrium output. In fact, we know exactly by how much. If taxes increase by 100, then you know that the equilibrium output would decline by C1 times 1 over minus C1 are your change in taxes.

Here would be a little different because there is also remembered investment also has a propensity to spend as a function of output. So it would be a little different, but that's the kind of calculation.

What else would shift the IS this way?

AUDIENCE: Decrease in government spending.

RICARDO CABALLERO: Decrease in government expenditure will do that. What else? This is another thing I want you to do-- think of everything-- because for sure you're going to face that in the quiz-- anything that would shift the IS curve. What else would shift the IS curve?

AUDIENCE: Decreasing export.

RICARDO CABALLERO: Yeah, that's true, but that's not for this part of the course. Remember, we're in a closed economy. So here we assume x equal to M equal to zero. IM equal to zero. That comes after quiz one. What else?

Things that were captured-- remember, when I began this lecture, I showed you wealth, what had happened, and so on. There's nowhere wealth in this model here. It's just output. But wealth affects how much consumers consume. So autonomous consumption. There were lots of stuff hidden in that C0, that constant C0. Remember C0 plus one and one.

Well, C0 captures things like how confident were consumers, how wealthy they felt, and stuff like that. So anything that shifts C0 down, consumer sentiment declines, wealth declines, something like that, will also shift IS to the left. So that's important. Good.

So we're done with IS for now. Now with IS alone I cannot find what I want. I want to find combinations of interest rate and output that are consistent with equilibrium in the goods and financial markets. This doesn't do it because it gives you only combinations that are consistent with equilibrium in the goods market.

So I now need to look at financial markets, which is the other side, the LM relationship. And remember what we had. We had equilibrium in the financial markets. We had two instruments that we could use. Remember we had only two assets-- money and bonds. So we could look at the equilibrium in money or equilibrium in bonds. It's the same. But we did it all in terms of money.

It's the same because given wealth, if one is in equilibrium, the other one has to be in equilibrium as well. So I only need to look at one, and we're looking at money.

So money is equal to money demand. I'm going to divide both sides by P. This is not going to be very important now, but later it will be. And so we're going to have that-- This is equilibrium in financial markets. Means that real money supply equals real money demand. That's what we have here.

So this, you already see it traces combinations of output and interest rate which are consistent with equilibrium in financial markets.

In the past, that's the way the LM would be described. We would fix M and say, well, this will give you an upward-sloping curve. Because this is downward sloping, so if this guy goes up, I need to-- if this is constant, this guy goes up. This guy needs to come down. What does that? What does bring L down? I going up, because L prime is negative.

So that's the way LM used to be described. Your life is a lot simpler today. It's a lot simpler because central banks don't target monetary aggregates. They don't target M. They target the interest rate directly. So they tell you the answer already. The central bank, when it does policy, it says, look, I tell you what I will be. Then if output moves around or whatever, it's a problem for M. We'll provide the M that the market needs in order to have an interest rate equal to the one we want.

So it is true that it captures all the combinations of output and interest that are consistent with the equilibrium in the financial markets, but it's very simple because what the fed does in the US or other central banks do is they say, OK, this is the interest rate we want. And now you can put any amount of output you want. As long as we remain committed to this interest rate, it will be consistent with the equilibrium in the financial markets because we will do it so.

And the way we will do it so is we'll provide as much M as the market needs so that that combination of output and interest rate is an equilibrium in the financial market. That's a very long way of saying that the fed sets I and then M is whatever is needed for this equation to be in equilibrium. So if output rises and the fed doesn't want to change the interest rate, that means you need to change M.

So suppose that the fed says, I want this interest rate to be fixed at this level. Call it I0. And now output turns out to be higher. What will the fed do in order to ensure that I remains at I0? What if the fed doesn't do anything? So the fed says, I want I equals 0, and the fed is calculating that output will be about a certain level. And it turns out that output is higher.

What happens if the fed doesn't react and keeps the interest rate at I0? An output tends to be higher than what they thought when they provided the M that they thought the market needed to be in equilibrium with that interest rate. What will happen?

The interest rate will go up because money demand will exceed money supply. The only way to restore equilibrium is for interest rate to go up. But the fed doesn't want that, so what the Fed will do is when it feels that, it feels the interest rates are going up, they will provide more money so they can restore equilibrium in the financial markets at that level of interest rate despite the fact that output ended up being higher than they thought.

So all this is a long-winded way to say that the modern LM is horizontal. A few years ago, that curve would have been upward sloping. But given the way monetary policy is conducted nowadays, your life is a lot simpler. The LM is a horizontal curve. The fed tells you, the central bank tells you what the interest rate has to be, and then it will give whatever M, will provide whatever M is needed. So that's the equilibrium interest rate.

So what shifts the modern LM? And by modern, I only mean-- the book doesn't use that terminology, but by modern I mean that the fed decides what the interest rate is.

AUDIENCE: Won't that change your interest rate?

RICARDO CABALLERO: Exactly. The only thing that will shift-- your life is very simple. The only thing that will shift the modern LM is that the fed changes its mind. A few years back it would have been more complicated. A change in money demand. A change in money supply. All those things would be shifting the LM around. Now in this setup it's very simple. It will change only if the feds changes its mind.

Now obviously the fed is not just a moody institution. It will change the mind, and sometimes it's forced to change its mind. They're not happy with the interest rate they're setting nowadays. They have been forced into that. They were very reluctant to go into this very high interest rate. But what is happening around with this very high consumption and the impact that is having on inflation, they have been forced into moving interest rate not only very high but also very fast, and that was very risky.

We have been lucky that nothing has really broken. Normally when central banks raise interest rates so fast, they break something along the way. Somebody is very levered out there, some bank or something like that, and you can blow up. In the UK we had a little scare with some insurance companies, but that was for a different reason.

But it's scary to move policy very fast because this is a very important price for financial markets. Everything in financial market gets priced off-- that's the starting-- any pricing model for stocks or anything will start from that policy rate, and then everything builds from there. So if this has to move fast, you can have lots of dislocation.

So my goal for today is just to give you the instruments, and then we're going to all talk about combinations, things that we did in certain episodes and things of that kind. OK, good.

So again, this part of the IS-LM model is very easy, and it's a lot easier now than it was a few years back.

So what does the IS-LM model? The IS-LM model simply mean puts the two curves together. Now we have two curves in the space of output and interest rate and two unknowns, which is output and the interest rate. So we have one combination only, A, that is consistent with both equilibrium in the goods market and equilibrium in financial markets. That's the point A.

What happens to points to the right? What happens here if I show you this point in this space? What's wrong with that point? So a point along the LM but to the right. What's wrong there?

If it is along the LM I know that I'm OK with financial markets. Those points are consistent with the equilibrium in financial markets. But it's not my equilibrium, so it has to be inconsistent with the other one. It's not consistent with equilibrium in the goods markets. In fact, you know more than that. What's wrong with goods market? There's an imbalance there, but in which direction? That point here.

AUDIENCE: Excess of goods.

RICARDO CABALLERO: What do you mean by excess of goods?

AUDIENCE: The demand is not meeting--

RICARDO CABALLERO: No, demand. Exactly. Insufficient demand. There is too much output for that demand. So that's the reason it's not consistent with equilibrium in the goods market. To the left it's the opposite. To the left we have insufficient output for the demand we have, so it's not consistent with the equilibrium in the goods market.

So the only point that is consistent-- well, you can think, what happens with a point here, for example? That point, because it's in the IS curve, is consistent with equilibrium in the goods market, but it's not consistent with equilibrium in financial markets. What do we have there? Suppose I'm in that point. The interest is too high, so that means-- and the demand is low, so too much money demand for money supply. That's what you have.

So at the end of the day, this is the only equilibrium point we have. And all the experiments we're going to do next have to do with moving one curve or the other and see what happens to trace new equilibrium points.

But try to understand very well these diagrams, so what happens when I move up, horizontally, and so on, and convince yourself that this is the only combination. It's pretty easy to convince yourself that it's the only combination, but think a little. Try to get away from point A and see what happens. I guess the best way to do that is just to do experiments, meaning move parameters of these curves and see how equilibrium output changes and so on.

So let's do the first experiment. Yeah. So let's play with this. So now you have your model, and now we can start asking interesting questions. The first thing you can ask is fiscal policy. How does it work? Well-- sorry.

So this is a contractionary fiscal policy. So the same as we did before, remember, we increased taxes or we could have reduced government expenditure, whatever. That would have shifted IS. We did that. When we look at IS, we did exactly that. We shift the IS to the left.

And what happens here is, well, if you shift IS to the left there is a new combination of output and interest rate that is consistent with equilibrium in both markets, and that's a lower output.

So if the fed doesn't do anything, that means it keeps the LM there, and there's a contractionary fiscal policy, that will lead to a contraction in output as well. That's the reason we call it contractionary. Not only because fiscal-- not only because government expenditure declined. But if taxes increase, that's contractionary because it reduces aggregate demand, and the equilibrium, that will reduce output.

So that's canonical contractionary fiscal policy. You move output to the left. Interest rate doesn't move because that's controlled by the fed, but output declines. So if somebody asks you what happens if there is a fiscal contraction, you were asking a bit the opposite side, that people may have spent-- we had perhaps a fiscal expansion that was very large.

But what happens with a fiscal contraction? That will lead to lower equilibrium output. I keep pressing the wrong button. Lower equilibrium output. What happens if you have a very large fiscal expansion? What happens if you have a very large fiscal expansion? What moves?

That's something you should-- that's a question-- you should always ask yourself when there is any question of IS-LM, you should ask which curve moves. Start from that always. If we ask you any question that it's obvious about IS-LM, the first thing you should ask is which curve will move.

So suppose I tell you due to COVID, the COVID shock, there was a massive income transfer to low-income individuals. That is we had a very expansionary fiscal policy. First thing you should ask is OK, which curve moves-- the LM or the IS? If I do that. It's the IS. Shift to the right.

Does LM move? No. Has nothing to do with monetary policy. So that's the first thing you need to do. Which curve is moving? If it is fiscal, that's a good market thing. That means it's going to move the IS. Not the LM.

What is the mechanism here? What happened? Remember what we have. I told you, go always back to this diagram. If you increase taxes and you keep the interest rate constant and you start from there so the interest rate doesn't move, then that will do what increasing taxes did in lecture three- it will reduce aggregate demand, and then the multiplier will take us to a larger decline than the initial fiscal contraction. And that's a declining equilibrium output.

So that y1 one there is exactly this one here. That y prime. I haven't moved the interest rate. I kept it at the same level. I had a fiscal contraction. That's what we described with that diagram. That's my new IS. I have a new IS because for the same interest rate I have a lower equilibrium output.

And it happens that the fed didn't change the interest rate, so that's going to be [INAUDIBLE]. With the whole curve moved to the left, that we could tell three slides ago, but now I know more. I also know that since the fed hasn't reacted, I know exactly what is the new equilibrium output, which is this.

Before, we could only tell that the curve has shift to the left. Now, since the fed didn't react to that fiscal contraction, I also know the equilibrium output will end up at y prime. OK. Good. So I'm going to stop here, and in the next lecture we'll continue with this.