

[SQUEAKING]

[RUSTLING]

[CLICKING]

RICARDO J. CABALLERO: OK, so let's continue with this IS-LM model. Remember in the previous lecture, we set up-- we set it up. We built the IS-LM model. And we'll go over that very quickly in this lecture because I think it's very important for you. And then, we're going to use it. And eventually, we're going to talk a little bit about the policy response, the macroeconomic policy response during the COVID-19 shock, or recession, all of the above.

So the starting point-- remember, the first thing we did, we constructed the IS relation. And the IS relation was just the same as lecture 3. But we sort of spelled out what is inside that investment that we had taken as a constant there. We said, well, far more realistic is to make investment itself increasing in output because it's increasing in sales. That won't change the analysis that we had in lecture three. All that will do is change the slope of the aggregate demand curve, and therefore change the multiplier. But we could have solved everything in terms of lecture three.

What made this a little different from lecture three is that we also said the investment-- real investment-- remember, this has nothing to do with financial investment-- real investment is also a decreasing function of the interest rate. And that led to the IS relationship, which essentially says these are all-- the IS curve traces all the combinations of output and interest rate that are consistent with equilibrium in the goods market. That's the definition of that IS.

Now, of course, in lecture three, we were able to determine the equilibrium output. Here, we can't. Why can't we?

AUDIENCE: Because we're tracing a curve [INAUDIBLE].

RICARDO J. CABALLERO: Yeah, we have to announce its output and the interest rate. And we have only one relationship, the IS curve. So the reason for the LM curve is that we need to pin down the second variable. And that's what LM will do. And it will be sort of very brutal about it. In the past, you remember it was some upward-sloping relationship [INAUDIBLE] said in the previous-- no, that's not what the central banks do today. They just set the interest rate.

So if the central bank sets the interest rate, then you can use lecture three to pin down equilibrium in the goods market, which is what you would effectively be doing here. If you fix this interest rate at whatever level the central bank wants, then now you have one curve for one unknown, which is output. And that's exactly what we saw in lecture three. OK? Good.

So I said, lecture three now, this ZZ curve [INAUDIBLE] a little steeper because investment also responds positively to increases in output. Importantly, now we have an interest rate, which is a shifted of this aggregate demand. In particular, if the interest rate goes up, what happens to that curve? So as the interest rate goes up, what happens to the aggregate demand curve? I have two candidates here, down or up.

AUDIENCE: Goes down?

RICARDO J. CABALLERO: Down. Yeah, because investment drops. So you can tell me even more by how much-- if I tell you how much a change in the interest rate is, and I tell you what is the sensitivity of investment to the interest rate, you know exactly by how much this thing will come down. It's going to be the change in the interest rate times the sensitivity of the investment function to the interest rate.

That's not the end of the story, as you well know. That's the horizontal shift in aggregate demand. But the final decline in output will be larger than that initial decline in investment as a result of the higher interest rate. Why is that?

So someone, say the Fed, raises interest rate, that immediately reduces investment because investment is negatively related to the interest rate. That immediately decreases aggregate demand, which immediately decreases output. Because in this part of the course, output is determined by aggregate demand. Thus, the adjustments stopped there.

No, that's what the multiplier was about. Because now with lower income, there is lower consumption and actually lower investment as a result of that, and we keep going. So the final decline in output is a lot larger. And doing that kind of experiment, moving the interest rate around and seeing what happens to equilibrium output, is that we derive-- we constructed the IS curve.

Here is for-- a cut in the interest rate. Oh, this is exactly the experiment I just described. So if you raise the interest rate, then aggregate demand comes down. And then output declines by a lot more than the initial decline in investment because of the multiplier, but eventually, we get to another equilibrium output, which is that.

So now we know that this point belongs to the IS curve because it's a combination of output, Y' , and interest rate, i' , that is consistent with the equilibrium in the goods market. That's what lecture three told us. That's what equilibrium in the goods markets look like. That's another point of the same IS. Because I have higher output here, lower interest rate. That's another point of the IS. That's the reason this is downward sloping.

Look at what I just said. I said, I have another point of the same IS. How do I know it's the same IS and not some other IS? All that I told you there is I found two points, two combinations of output and interest rate, that are consistent with equilibrium in the goods market. But I said a little more. I said, and that's part-- that's the way we construct one IS.

AUDIENCE: Because you're holding everything like tax [INAUDIBLE].

RICARDO J. CABALLERO: Exactly. Because there is a lot of other parameters that we're keeping constant there. That's the distinction between a movement along an IS curve, which is-- the only thing I move is the interest rate that allows me to trace a movement along a single IS. If I move something else, like taxes, foreign expenditure, or autonomous consumption by-- something like that, then I will be shifting the aggregate demand for any given interest rate. And I'm going to get a different level of output for any given interest rate, which means I'm going to be in a different IS.

And that's what we did there. In that case there, we said, look, I can fix the interest rate, any interest rate you want. Let's pick this one. But I could have done it at an interest rate here, there, whatever. And now, I say, what happens if I increase taxes?

Well, again, you know from lecture three exactly what happens when the interest rate is constant because there, we didn't even talk about the interest rate. Nothing was a function of the interest rate. And you increase taxes. Well, that would reduce disposable income for any given level of output, and that will lead to a contraction in aggregate demand and output, and so on, and so forth.

So that means that for this interest rate, now I found another point-- another point that is an equilibrium in the goods market. But it belongs to a different IS because I moved one of the parameters, which is the taxes. And now for this higher level of taxes, I can play around with the interest rate. I can say, well, what happens if I cut interest rates?

Well, if I cut the interest rate, we're going to find another equilibrium, say here-- if I cut the interest rate from here to here, I'm going to find another equilibrium level of output which is consistent with that very same IS. Why is that very same IS? Well, because I haven't moved taxes again. So the reason I'm repeating this is because, I told you, it's very important to understand what is a movement along the IS versus what shifts the IS. OK? Good.

Then, we move to the LM relation. And the LM relation is just equilibrium in the financial markets. This is combinations of output and interest rate that are consistent with equilibrium in financial markets. And we constructed from our money supply equal to money demand in nominal terms. Then, we divided by P , which is not very interesting in this part of the course because P is constant. We are assuming that P is not moving. That's the price of goods and services. And then we have this equilibrium here now stated in real terms. So real money supply is equal to real money demand.

And as I said, had you taken this course a few years back, or perhaps in other places, that would have been an upward-sloping relationship. So the LM would have been an upward-sloping relationship. How do I know it's upward-sloping? Well, because if I don't change money supply and I increase output, then I need to bring L down. And since L' is negative, the way to bring L down is by increasing the interest rate. So that's what it would have given you, an upward-sloping LM curve.

I said, we don't do that now because, really, banks, central banks abandoned a long time ago in most parts of the world-- not everywhere-- this idea of targeting M . But they target directly the interest rate, and then they give you whatever M that you need-- they need in order for the equilibrium in financial markets to be consistent with the interest rate the central bank wants to set.

So I said the modern IS curve really looks like that. The Fed and the US central bank, anywhere else, sets the interest rate. Turkey is a little different. [SOFT LAUGHS] But sets the interest rate. And that's the LM.

Now, this particular LM says-- it's a flat curve. It's not a function of output. The Fed sets the interest rate. That's it. That's the reason. It's flat. It's not upward-sloping or anything. So I asked the question, what shifts the modern LM? Only the central bank. Because the central bank is the one that sets the interest rate, certainly in-- well, let me not complicate things. So it's the interest rate. So if the central bank doesn't change its mind, then the interest rate is whatever it is, and the LM will remain there. OK? Good.

So we put the two things together, and now we can pin down equilibrium output. Because remember, we had-- when we just looked at the IS, we had combinations of interest rate and output that were consistent with equilibrium in the goods market. Now we have an interest rate which is consistent with the equilibrium in financial markets, that's what the central bank is there to ensure.

And so at that interest rate, we can look into the IS, what is the level of output that corresponds to that. That's what we get here. So now, we found an equilibrium. We found a combination of interest and output that is consistent with the equilibrium in both goods markets and financial markets. And that's what the IS-LM model is about. It's about finding those combinations. Good. Is this very clear? Yes? OK, good.

So now we can begin to play with this stuff. One of the main purposes of the IS-LM model is to understand policy, macroeconomic policies, what you should do in certain environments or not. Well, before knowing what you should do in certain environments, you need to understand what is it that the different macroeconomic policies do to equilibrium output and interest rate, and so on.

And so that's what we began to do. And the first experiment was one of fiscal policy. So that's an example of a contractionary fiscal policy. That could happen as a-- contractionary fiscal policy is essentially increasing taxes, like we illustrated before, or a reduction in government expenditure. Either of those will lead to a shift in the IS to the left.

Remember from lecture three, if I increase taxes or reduce government expenditure, equilibrium output will fall. Thus, lecture three. Remember? And so I can trace-- using lecture three, I can tell you, well, the IS will shift to the left. No, we just did that. But now we know more because we know that the central bank is also pinning down the interest rate.

And in this particular example here, the central bank did not go along with the Treasury Department and say, OK, I'm going to keep the interest rate wherever it is. You do whatever you want with the fiscal policy. So this is an example of a situation where fiscal policy is contractionary and the central bank remains with its previous target, interest rate target.

So as a result of that, a contractionary fiscal policy, as the word says then, is a contraction in aggregate demand policy ends up also leading to a lower equilibrium output. And then I ask, I already told you two things, T up or G down. But what else would do something similar to this, which is not policy?

AUDIENCE: Just any shock of aggregate demand, right?

RICARDO J. CABALLERO: Exactly. I want anything that is a shock to aggregate demand different from interest rate or anything like that. So, for example, consumer confidence, that thing that we put in C_0 . Or wealth, something that wasn't in the model but clearly what is behind C_0 , that would lead to a shock like that, and that's contractionary. That's the reason central banks and financial markets are all the time looking at the releases of surveys of consumer confidence and things of that kind because these are the implications of shocks to consumer confidence and so on. OK, good.

So what is the mechanism here, well, we have discussed it multiple times. The contraction in fiscal policy lowers the aggregate demand down. Then, we multiply and you end up lowering output a lot more. And this happens for a given interest rate. I'm having the same interest rate here and there because I'm looking at two points along for a fixed LM, for a fixed interest rate. Good.

So that's the contractionary monetary policy. Needless to say, an expansionary fiscal policy is just a shift in the opposite direction. So what will an expansionary fiscal policy do to equilibrium output? Expansionary. It will increase output, again, contractionary fiscal policy reduce output or will it do the opposite? Obviously, it will increase output. So that's expansionary fiscal policy. And it's a very important tool to move output around when the economy's in a recession, or so on and so forth.

The other canonical macroeconomic policy is monetary policy. And that's an example of an expansionary monetary policy. So an expansionary monetary policy cuts the interest rate. Why is that expansionary? Well, look, it is expansionary-- let me take this as-- I'm going to do things in a step. So claim first. An expansionary monetary policy is a reduction in the interest rate. So the central bank now decides to set a lower interest rate than it used to.

As a result of that-- if output didn't change, what would happen in the goods market? So suppose that the Fed cuts the interest rate and output doesn't change. Is there an equilibrium in the goods market? Is there an equilibrium in the goods market? Suppose that the Fed cuts the interest rate and now we say, OK, well, nothing will happen here. Output will stay where it is. We will have a lower interest rate, that's nice. Why is that not the final outcome of the monetary policy expansion?

AUDIENCE: Because then the [INAUDIBLE] market reacts and aggregate demand [INAUDIBLE].

RICARDO J. CABALLERO: Exactly, this is an imbalance. No, because aggregate demand now, at low interest rate, investment will go up. This fiscal investment, remember, purchases of goods and services by firms for the purpose of building capital, structures, and things like that. So aggregate demand went up, so now we have a disequilibrium there. Output is less than aggregate demand. And we know that output is determined by aggregate demand, and then we go on through all the mechanism.

So at this point, it's not at equilibrium. We're going to end up with a higher level of output. At that lower interest rate, we have a lower level of output. Therefore, it's not surprising that we call this an expansionary monetary policy. So when the Fed cuts the interest rate, that's an expansionary monetary policy. This will expand aggregate demand. So how does the Fed implement this? Sorry.

AUDIENCE: They can do expansionary open market operations.

RICARDO J. CABALLERO: Yeah, there you are. Perfect. So what they need to do is do some expansionary monetary open market operation. Again, now it's a little more sophisticated than that, but let's stick with this. That is the first thing they'll do is they'll shift money supply. They'll go out there and they start buying bonds and giving money to-- injecting money into the system, particularly through the banks. So that's the initial response. That's what will cut the interest rate.

What happens next? This will allow me to illustrate the modern IS. Remember, the Fed's decision was not to increase the money supply by 35%. What the Fed communicated to the market was that it was going to cut interest rates by 50 basis points. That's the communication.

So initially, the way it does that overnight is it goes out and does exactly that. So what it did is what we have there. We had some interest rate, i_0 . The Fed now wants to go to i_1 . So in order to do that, well, you have to look at this money demand and increase money supply to achieve the lower interest rate.

The question I'm asking you now, does it stop there? So the Fed says, OK, I did my job, I want to lower the interest rate. I'm going to increase M. I increase M. And now, I manage to bring the interest rate down to that point. And that-- they're intervening overnight market, so that happens very quickly. Do you think that the Fed now can sleep for a while? Why not? There are many reasons why the feds cannot sleep for a long time, but in this particular case.

AUDIENCE: [INAUDIBLE]

RICARDO J. CABALLERO: OK, yes. Money demand will increase.

AUDIENCE: [INAUDIBLE]

RICARDO J. CABALLERO: Why?

AUDIENCE: Because now, [INAUDIBLE] increasing?

RICARDO J. CABALLERO: No. So the first shock was an increase in money supply. The point-- the thing you want to say is that because now the interest rate is lower, equilibrium output will go up. But if equilibrium-- output goes up, then what happens in this diagram?

Well, the money demand goes up. Because remember, one of the parameters in this curve was output. Remember? This was output times L . That's that curve there. In this money demand, I had output fixed at Y_0 . But now equilibrium output is higher, so this curve will also shift out. Now you're going to have $Y_1 L$ there.

So what will the Fed do? See, the Fed doesn't do anything and it stops here, then the interest rate goes back up, not necessarily to the old level, but it will go up. So what the Fed will have to do is keep expanding money. Sorry, it's an ugly diagram. But it will keep expanding money up to-- so it can preserve the interest rate.

In the old analysis, you would have stopped in the first shot, but nowadays, that's not. The Fed says, look, I'm going to provide money, and I know it takes time for output to expand and all that, so I will accommodate all that comes. It will not come overnight, all this extra demand for money, but I know there will be more demand coming along if I'm successful at expanding economic activity. So the central bank knows that if this ends up happening, then that it will have to provide more money than initially just to preserve the interest rate at the lower rate level.

Again, we don't have any concept of time in this course. And I don't think that-- well, we'll do a little bit later. But things happen in reality-- in the financial markets, they happen very quickly and then they take time. The real side is much slower. I mean, this expansion in output takes a couple of years, for example. It's slower.

The reaction of interest rate, asset prices, and so on happens over night, instantly. When people do analysis of the impact of monetary policy on financial asset prices, you look at the small windows, minutes around an announcement or something like that to understand what is the impact. When you look at the impact of monetary policy or prices on real activity, you look over the span of quarters. That's your unit of-- and you begin to see effects a quarter later. And you keep seeing effects, you know eight quarters later. So different time scale.

In this course, we're not worrying about that. But everything happens at once. So really, what will happen in this course is that it won't be enough to increase money supply to this point. In order to have an interest rate at the final equilibrium level of output, at this level, I'm going to have to expand money supply a lot more. That's what I'm saying. Good.

So again, I can always go back to my lecture three. Remember, I always-- I told you that that diagram in lecture three was going to be very important. The expansionary effects of an expansionary monetary policy can be analyzed in the lecture three diagram, because there, we take as given an interest rate. And now, we know that when we have a higher interest rate, a lower interest rate will bring this aggregate demand up, and then we get the multiplier, and blah, blah, blah, blah, blah, blah. That's what happened.

So this is a movement in the-- when monetary policy changes-- that's another thing that is very important when you do IS-LM analysis. Whenever you ask a question, the first thing you need to think about is, which curve is this policy moving or which curve is this shock moving? And what I know is that monetary policy-- fiscal policy will always move the IS.

Will it move the LM? No, it has nothing to do with things that happen in financial markets. That doesn't mean that the Fed may not wish to respond to the fiscal expansion or whatever, but that's a response that the Fed decides. It's not a direct consequence of the fiscal policy. Fiscal policy is not bundled with interventions in the financial market.

Contrary to that is monetary policy. I tell you the Fed decides to cut interest rate, that's a movement of the LM. It has nothing to do with the IS. So anything that happens in the IS is going to be a movement along the IS, not a shift of the IS. So that's what we saw here.

When the Fed cut interest rate, we end up with higher output, but that was a result of a shift along the IS. Because monetary policy is not an IS policy. It's an LM policy. Fiscal policy is an IS policy. That is something that shifts the IS and not the LM. So that very important to understand, again, what moves what.

OK, so let's look at the-- anyways, so let me pause here. Because if you understand what I just said, it's 2/3 of your quiz. So make sure that you understand it. I mean, if you really understand it-- obviously we're not going to ask you exactly this, but small perturbations around what I just said.

So now, we can use this stuff even more. Now we understand what the basic monetary policy does. We're going to understand what basic fiscal policy does to the economy. Let's look at some scenarios. This, I'm calling all in. What am I representing there? In that diagram? So I'm saying all that you see in that diagram is a result of policy decisions, macroeconomic policy decisions.

AUDIENCE: Expansionary fiscal and monetary policy?

RICARDO J. CABALLERO: Exactly. That's the reason I'm calling it all in. That's the case in which both want to be very expansionary. And so you see that the expansionary monetary policy already sort of increases equilibrium output. But then you add to it expansionary fiscal policy, which moves the IS to the right, and you further increase output. So you end up with a big increase in output as a result of this powerful policy package.

When do you think you may see situations like that? Sometimes you see it out of pure irresponsibility. I mean, people go to Argentina, this happens all the time for the wrong reasons. But if in normal times, normal environments, when do you think that-- I shouldn't have said "normal times." In normal environments, sort of with sound macroeconomic policy, when do you think you would see something like this?

AUDIENCE: Recessions?

RICARDO J. CABALLERO: Recessions. And the biggest-- during recessions, you need to get the economy out of the hole. And then you probably-- you first try monetary policy because that's the most direct and quick. I mean, that's a decision that can be made overnight. But often, when the recession is sufficiently deep, that's not enough and you need more. And that's what you do with fiscal policy.

There are other reasons-- there are other differences between the two policies. Because we're not looking under the hood here. But, for example, in COVID, it was very-- a certain group of people were much more affected than others. I mean, people that work in restaurants, those guys just lost their jobs and there was nothing they could do. So there was a reason to target the transfers-- when you use interest rate, it's a very blunt policy to everyone.

When you use fiscal policy, you can also-- it's not only the amount you spend, but you can also target the expenditure in certain directions. And so there are other reasons why you may want to use the two tools. But the main one is-- the first order one is if you're in a deep recession, you need everything to try to lift the economy out of that. And so that's the kind of packages you see in big recessions.

Now, there's a slide that I think I have pending from two lectures ago. And this is a good opportunity to bring it back. Remember when we looked at equilibrium in financial markets, we came up with this downward-sloping demand, money demand. And then we said, well, if you lower the interest rate, there's more money demand, and so on, and so forth. And then we said, therefore, the way the Fed lowers interest rate, or the central bank lowers the interest rate is by increasing money supply.

The point of this picture is that there is a limit to that. And the limit is, more or less, when the interest rate reaches zero. Because when the interest rate reaches-- the nominal interest rate reaches zero, then there is no cost in holding bonds-- in holding money, sorry. The only reason for you not to hold all your wealth in the form of money is because you were giving up some opportunity cost of investing in bonds, which were inconvenient financial assets because you couldn't transact with them, but they pay you higher interest rates. That's the reason you want to go there.

But once you reach zero interest rate, then you're indifferent and you might as well hold. If the central bank goes out there and does an open market operation, you don't need to be compensated for that because you're totally willing to hold your wealth in the form of money. And so monetary policy is no longer effective when you reach what is called the zero lower bound. And that's what we call the liquidity trap. It's called the liquidity trap. Let me not get into why. But essentially, it's that. So you can inject more and more liquidity, but you cannot move the interest rate, so you lost a policy tool.

This was the tragedy of Japan for many decades. They were stuck against the zero lower bound, the liquidity trap. And so they had to go through massive fiscal expansions because they didn't have-- they were in recession, chronic recessions, and they didn't have a very powerful monetary policy tool because they were against the zero lower bound.

So why did I use this opportunity to bring this about? Because that's, for the reason I just described, in the case of Japan. But I asked the question, what would you advise the government to do? Well, I already told you the answer. If you have an economy in a recession, and this means you use all the monetary policy that you had, conventional monetary policy that you have-- now we have unconventional monetary policy, but I'll tell you a little bit more about that later. But once you run out of this and you're still in a recession, what would you tell the government to do?

AUDIENCE: Use fiscal policy?

RICARDO J. CABALLERO: You use fiscal policy. That's the other tool that you have. So that's a typical situation you see. When countries-- the interest rates are already very low, they tend to use much more actively fiscal policy because it's the only policy they have left. And that has been the case of Japan, again, since the crash of their financial bubble in the late '80s, early '90s.

So look at the COVID-19 response. Something happened to my figure here. But anyways, this is zero, essentially. So this is COVID. The COVID shock happened. Clearly, the economy was imploding into a recession. The Fed immediately reacted and cut interest rates very, very aggressively to zero.

And then, we were stuck there. This is effectively zero. I mean, there are technical things-- the thing moves a little, but this is effectively zero. So the US was, during that period, against really a liquid-- against the zero lower bound. There was no more power for the kind of monetary policy that we have described here.

So let me-- so that tells you that there's going to have to be lots of fiscal policy if you want to get out of that. And I'll show you that later. There was a lot of fiscal policy. But before getting there, I'm going to show you something that you don't need to really know for the quiz, but so you can understand what is going on in the newspapers a little better.

The Fed-- that was not the only-- precisely because the situation with Japan was so chronic, people began to develop lots of tools, alternative tools for central banks to use when your interest rate-- the main interest rate you use is stuck against zero, against the zero lower bound. And that's what you may have heard-- it's called sometimes unconventional monetary policy, QE, quantitative easing. All those kinds of things, they represent essentially policies that are like monetary policy, but they are not exactly the way we have-- because they are not interventions in the very short-term bonds. They are interventions in other assets out there.

In this course, we have it very simple. We have only one interest rate. In reality, there are multiple bonds. There are risky bonds. They're spread. Somebody asks about risky bonds in a few lectures ago. They are spreads. There are lots of interest rates floating around.

So in principle, a central bank could intervene in those other rates as well. In fact, in Japan, they have even intervened in the stock market, and that tells you how far they can go. So in a richer environment with more financial assets, in principle, the Fed could go beyond the standard short-term bonds that they go for their open market operation. And that's exactly what they have been doing.

A way of thinking about that is, remember, when we look at the monetary-- expansion in conventional monetary policy, we start with a balance sheet like that. Remember, we said the central bank has bonds and the money. If it wants to have an expansionary monetary policy, it goes out there, it buys more bonds and gives them the-- it gives the bank's money.

And that expands the balance sheet. You end up with more-- the balance sheet of the central bank ends up with more bonds and also with more liabilities because it gave more money to people, banks, and so on, so it owes more money. So monetary policy naturally-- expansionary monetary policy naturally leads to an expansion of the balance sheet.

Now, for years, outside of Japan, nobody really cared too much about that because this effect, relative to what you saw in the interest rate, was very small. I mean, yeah, the balance sheet was moving a little bit, but it was mild. And also here. We hit the zero lower bound. And essentially, the Fed went out and bought all sorts of things.

First of all, when you hear QE, quantitative easing, that means mostly that the Fed goes out there and buys not only short-term US Treasury bonds, but long-term bonds. Because there's something called the term spread. Typically, interest rates in the long run are higher than the interest rates in the short run, typically, controlling for a bunch of things, and that's called the term "premium."

Well, they went and bought those kind of bonds. They also bought bonds issued by Fannie and Freddie-- Freddie Mac-- no, Freddie and Fannie, mortgage-backed securities, a bunch of stuff, even loans. In fact, they created a facility to buy corporate bonds.

And at some point, they created a facility to buy fallen angels bonds. Initially, it was only investment grade bonds, so all the companies that have the best possible rating. But that wasn't enough, so they went out there and created a facility to buy fallen angels bonds. Fallen angels were essentially companies that were prime companies before COVID, but after COVID, they didn't look so good; airlines, cruises, and stuff like that, hotels, and so on.

So that was a massive expansion of the balance sheet. So in terms of this, this guy grew a lot. But the purpose, that's like monetary policy. That's what we call unconventional. It's different from the standard one, but they were doing-- trying to operate very much like monetary policy operates.

Here, you see the balance sheet of the Fed. You see, before the global financial crisis or the Great Recession of 2008, 2009, the balance sheet wasn't an interesting thing to look at for the central bank. Because, yeah, they did their regular open market operations and for anti-cyclical policy, but you would see small wiggles in the size of the balance sheet relative to the size of the balance sheet.

In the global financial crisis, they hit the zero lower bound for the first time, the US. And so there, you saw a massive expansion of the balance sheet. This is the number of assets. The same happened to liabilities. The other side of it is they're injecting massive amounts of money into the economy. So there, you saw a big expansion.

The recovery from the global financial crisis was hard because the financial sector was very compromised, so it took them a while. And they kept doing this kind of policies. Then they began to unwind the balance sheet. And then COVID came, and that's what I was showing you before. Massive expansion. They sent the interest rate to zero. That wasn't enough. And then they went out and bought lots of other financial assets, which work very much like monetary policy. Big thing.

And now, they're unwinding the thing. Now we're in the opposite process. We have inflation. We want to get out of this situation, so they're unwinding. But you can see the size of that. It's huge. Huge. I mean, this is-- the balance sheet a couple of decades ago was of the order of \$1 trillion, which was more or less of the money that is circulating around. Now it's \$9 trillion. Massive intervention.

And all central banks, major central banks look like this. I mean, the ECB also looks like this. The Bank of Japan looks like this. But actually, you don't see these blips as much because they began to do them here. So they have been accumulating for a long time. They have been using these kind of policies.

So coming back now to the course. What about fiscal policy? Well, I'm showing you different countries around the world. Massive fiscal expansions during the COVID episode. Massive. I mean, this is-- the US, the fiscal expansion, if you combine all the packages, it's of the order of 20% of GDP. That's huge for fiscal-- you don't see things like this, and this happened almost everywhere. Now, you don't see things like that outside of wars. This was really like a war, there's no doubt of that. The amount of expansionary fiscal policy we saw was comparable to what you see in a war.

So there you have it. Big recession, huge recession, massive policy response, both monetary of the conventional and unconventional kind and fiscal. And again, this was not unique to the US. It happened essentially everywhere. China is a little different for reasons I think I mentioned in the first lecture. But I may talk more about that later. Good.

OK, so another policy mix. This is different. So what do we have there? That's another policy mix that we see fairly frequently. So what is that? LM going down, that's expansionary monetary policy. IS is going to the left, that's contractionary fiscal policy. So when do you think you would do such a thing? Or countries would engage in things like this? Yeah?

AUDIENCE: What if you wanted to reduce government spending but you wanted to ward off a recession?

RICARDO J. Exactly. That's exactly the conditions when you want to do this. It's called consolidation of the fiscal deficit.

CABALLERO: Sometimes, you have a large fiscal deficit that's leading to accumulation of public debt, that doesn't look so good. So the government-- the Treasury, in the case of the US, may decide that it wants to reduce fiscal policy but is afraid because in doing so, it's going to cause a recession. And the purpose-- and there is no problem of output being over [INAUDIBLE]. It's just that the fiscal accounts look very weak.

So if that's the situation, that is if the economy is not going-- is not going through an overheating period and so on, and you want to reduce the fiscal deficit, in some places, it will be explicit, in some places, implicit. But the central-- because the central bank has a goal to keep prices stable and output close to the potential output.

So even if there is no explicit coordination, if the government announced a massive fiscal consolidation package, say it reduces government expenditure by 10%, the central bank knows that that's going to cause a recession. And so the central bank naturally will respond by cutting interest rate to that because the recession is not needed.

If the US announced today a fiscal contraction of 5%, I'm not sure the Fed would do anything. It will just stay there, put, because we have an economy that's overheating. So that's what you would do in a situation in which you want to fix the fiscal account and the economy is more or less at a normal time. It's not overheating.

When will you do the opposite? It's not, when would you do the opposite? It's, when are you likely to see the opposite? So first of all, what is the opposite? The opposite is a combination of a fiscal expansion with a monetary contraction. When do you think you would see such a thing?

AUDIENCE: Either maybe when the government has a budget [INAUDIBLE] and wants to increase spending, or maybe when they-- the interest rates are too high. They want to reduce interest rates.

RICARDO J. CABALLERO: Yeah. OK, that's true. But I'm not sure that that's-- yeah, but that requires a concerted decision and so on. It's true. Yeah, valid question. It's not the one I wanted. I wanted something more interesting, more exciting, but those are valid answers.

AUDIENCE: War.

RICARDO J. CABALLERO: War? No, war typically is all in. No. OK, let me note, I know it's a strange question, but I know where I'm heading. Suppose that the government decides to spend, for whatever reason. And the central bank says, whoa, we don't need that expenditure now. We don't need this fiscal expansion now because we're on the margin of overheating, and now we're going to get this big fiscal expansion.

Then, the Fed, the central bank, is likely to react to that and hike interest rate. That will make very upset the government. It always happens. The government gets very upset. And there's a guy that says, look, I'm trying to expand the economy, and you're fighting me. But that's the nature of the-- that's the reason central banks are meant to be independent. That's where they government-- they can offset that.

And the reason I wanted to highlight that example is I think some of that-- and somebody asked that question, I think, in the previous lecture-- happened to the US economy. One of the reasons we are in an overheating situation right now is because the US had a big fiscal expansion early in 2021.

And that fiscal expansion was, at the time, in which there wasn't much spare capacity in the economy. So we were very close to full employment. The supply side was very constrained and so on. And so there may have been good reasons for the fiscal package, transfers to people that you need to transfer and so on. But the macroeconomic consequences of that very naturally was going to lead to overheating. And the Fed did not respond to that.

And I think that's one of the reasons people think sometimes that the Fed-- well, there's no doubt-- exposed that the Fed was behind the curve. But one of the reasons they were behind the curve is that there was this big fiscal expansion, which naturally was going to span output, and they did not react to it. Eventually, they reacted, but it took them a long time. And by then, we had inflation and all that. So that's a situation in which we should have seen a picture like the opposite of this, but we didn't see the picture. We didn't see the monetary part, and that's the reason we ended up with an economy that is overheating. Oh, yeah?

AUDIENCE: Did the Fed ever elaborate on why they didn't do it? Or was it just for [INAUDIBLE]?

RICARDO J. CABALLERO: I mean, it's always-- it's a very uncertain environment here. Yeah, they thought this was going to be very transitory, that there was enough inflationary dynamics, disinflationary dynamics, that would offset all that, exposed it obviously it was a mistake, but it's exposed. I mean, there was a lot of noise and so on.

Then, there came the Russian war that sort of increased the price of oil dramatically, and that sort of created lots of bad dynamics. So they were unlucky. That part is the part that I think that-- again, they thought we were going through a temporary situation. They didn't think that it was going to be strong enough. They thought the supply side was going to expand a lot faster than it did. So they may have been right in not fighting it, but over a horizon of three years. And they found everything very compressed into three months, and that led to a problem.

So the last thing I want to show you is that this model-- how this model works in practice. I mean, obviously, you're not going to estimate exactly the model I show you. You have a real model, we'll have dynamics and many more things.

But the more complete version of what I just showed you, the IS-LM I showed you, many people have estimated sort of-- for example, I've estimated the response of the economy to monetary shocks, or to fiscal expansion, and so on. And they trace out different dynamics, different variables, and check whether that's consistent with the IS-LM framework or not. And the point of this figure is that it is very consistent with that. But let me show you a little bit about time.

So this is the effect on different variables of a surprise increase in the federal funds rate. That's the monetary policy rate. Federal funds rate is the interest rate that the Fed sets. And where you see that in practice, what you see is this is the impact on retail sales, on sales output, really, more or less. And, yeah, in practice, the output doesn't respond immediately. It takes a while. It takes several quarters. But eventually, it hits you.

And that's one of the big issues with monetary policy today is that clearly, inflation is not under control, but they have done a lot. And we know that it takes time for the economy to really perceive the full impact of a monetary policy. And so that's the tension now because lots of people are pushing the Fed to do more because we still have 6% inflation, but they have done a lot. And they know that monetary policy works with lags. "With long and variable lags" is a famous sentence.

And so it takes about six quarters to really see the mess, how much mess has been caused. It will take a while, so we have to see. You see, output, well, it's more like sales. It's the same thing. Initially, they trend slowly, but it takes a while, but it does have a very large effect. This is employment. Same thing.

These diagrams, you don't-- well, this is unemployment. Naturally, the other side of it is-- unemployment also will build up slowly. So unemployment is very low now. But we don't know when the economy really feels the impact of all the monetary policy has been done in the last eight months or so. Where will unemployment end?

And the big problem for the Fed today is something that you don't need to understand until the second part of the course is that prices do decline eventually, but it takes a long time. So to control inflation with monetary policy, it takes a while, a long time. Let's see whether the economy, consumers, and so on have the patience to hang in there. OK.