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Ricardo Reis on Inflation Risks

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Webinar Transcript

Transcript:

Markus Brunnermeier: Welcome back everybody to another webinar organized by Princeton for everybody worldwide. We're very happy to have Ricardo Reis with us, hi Ricardo. Ricardo is from the London School of Economics and he will talk to us about inflation risks, so we will get a much better understanding about the different inflation risks and also distribution, what inflation might come up in the next few years. So let me give you a few opening remarks, of course, inflation is all about expectations. Expectations are very important, the question is expectations by whom, is it by the households, which are part of the wage bargaining? By firms, which are also part of the wage bargaining, but also the price setting. Or is it actually the inflation expectations by the bond traders? And what drives the expectations, what are the salient prices which drive people's expectations, those are actually important questions. This is an important question, so in my book, I outline this inflation whipsaw, where I said okay in the Covid crisis, the beginning of the climate crisis, you saw this huge drop in inflation and then it went up significantly again, and now we are at record heights, so this is a five year Breakeven point calculated from the inflation implied by the treasuries, U.S. treasuries, compared to the TIPS (the Treasury Inflation Protected Securities) and you can see this decline and bounce back, radical bounce back, at the record height nowadays. Now the question is to what extent can we trust this data? Of course that's the inflation expectations of the bond traders, but to what extent do the QE measures of the central banks of the Fed buying long term bonds and buying various assets change this breakeven point? That's an interesting question. So it could be that if the Fed is buying much more nominal bonds and pushes the yield down of the nominal bonds compared to how many real bonds they buy, how many TIPS to buy, they push down the yield of the real bonds down, unless that might distort actually this breakeven point as well, so it's an interesting question to figure out whether these QE activities or purchases by the central banks actually is distorting this price signal, so the price signals may not be so valid anymore. And it is always interesting to figure out and Ricardo will talk a lot about options and inflation options and swap option markets, to what extent they are also affected by that, and how we can correct for these effects. Now, if you want to understand inflation anchors, you have to understand how people perceive whether that's a temporary phenomenon, if it will go back, is inflation anchored or not. And here, what is the big— here is not the bond traders, but the households, the households in inflation expectations from a survey conducted by the New York Fed and you can see, also, that actually the expectations went out significantly. So typically they are much higher than 2% which is the inflation target, they are typically higher. People expect high inflation but it's significantly went up recently in the last few months, but what's more important is the uncertainty, how uncertain people are also went up. So you see this on these dashed lines, so the band has widened, and the dispersion went up. So what's the difference between this and

uncertainty? Uncertainty is how uncertain are people about what the inflation will be, how well they can forecast it. And dispersion is how they differ in their opinion, there might be some people who think inflation will not be high at all and other people who think the inflation will be much higher, so there's a disagreement among people, and you can also see the disagreement went up as well. And you have to think: how does uncertainty in the disagreement weaken the inflation anchor? And that's you know one way, that we need some underlying theory to figure out how certain dispersion impacts inflation anchor down the road.

4:04

Markus Brunnermeier: Now, of course, people often argue, a lot of this inflation increase is due to higher energy prices and so typically considered as non core inflation, so it's considered as transitory, and of course there's this debate: is it transitory or permanent? And the argument is typically, this time around, energy prices might not be coming back because of this green revolution, we are going through a transition phase, becoming a green economy, and we discourage energy production (drilling for new oil and all this), so that actually gives less supply. We want that there's less supply from CO2 polluting energy, and this also increases the pricing power of existing code users and essentially we allow a certain cartel where the green—or the energy producers don't compete with each other anymore, because they can't expand the supply and that leads to not only to higher prices, higher energy prices, which is probably something we want and but it needs to persistent higher energy prices. It's not a temporary phenomenon so it's very different from earlier price increases because it seems like it's a persistent phenomenon and we also allow for some cartel, essentially because they can't compete with each other by expanding supply. It's like an OPEC arrangement 2.0 where they get larger profit, so all the energy producing firms will make larger profits. Just some announcements today said that some of these energy forms make large profits from these high energy prices. There's also an argument out in the green inflation debate whether we should actually remove energy prices from the basket all together because you know that's actually a policy we want in a sense, or a large fraction want that in a sense. We have moved to a green economy that will lead to high energy prices and hence we should discard energy prices from the consumption basket. But that's a little bit like moving the goalpost because high energy prices will hurt the consumers, and we should also— my view is that it should be part of the inflation data and should not be taken out. It's a little bit like a Communist Romania did at some point that changed the measure of the temperature just to make sure they don't have to pay out certain subsidies; you shouldn't change the measure and change the goalpost in the middle, because you undermine the trust as well. Finally, I want to say a few things about inflation and the Labor share and inequality so inflation is essentially pushing down the real wages and that leads to a further decline in the Labor share, and leads to more inequality. Of course if there is also an output gap, it can also lead to less unemployment which reduces inequality, but people argue that we are actually at full employment at the moment, so it's more the declining Labor share and the question is, do we want that. Inflation also erodes nominal savings, so the rich hold more real assets, and they're less touched by that. For the lower and middle class, there will be the whole role of savings in mostly nominal assets if it's not necessarily in housing, then they also suffer from this much more. This also leads to high inequality. So with these few opening remarks, I would like to go to Ricardo's questions and he will touch on them later again, and the questions are the following. What is the probability that inflation will stay above 4% between 2027 and 2032 so that's you know, several years in the future, five years out. Then, is it less than 1% (that's all what 12% said), is it between 1 and 5% (that's what 17% said), about 20% said between five and 10%, and D between 10 and 20%, that's about 30% thought it will be (between 10 and 20%). Between 20 and 40%, that's about 15%, and about 40% was the guess from about 5%, so the majority essentially was between. 10 and 20% and then the

second was five and 10%. The second question was for the euro area, what is the biggest risk? Is it persistent inflation, or is persistent deflation, like you know, a Japanification and so forth. The audience thought 40% persistent inflation is the biggest risk, 60% thought it is persistent deflation. So the deflation angst is still going around, especially for the Euro area. And the third question is, you know, a sustained record of high debt levels. We have to face a higher inflation, let's say above 3% over the next few years, would this be a risk or blessing? And about 60% think that's a risk and about 40% think that's a blessing, so there is actually quite some disagreement on that front as well. So with this, I pass the floor to Ricardo, who will answer his questions and tell us what the market thinks and what others think, and then we go to all the details from this. So thanks again, Ricardo, it's great to have you with us and we're looking forward to your presentation.

9:32

Ricardo Reis: Great. Thank you so much for having me Marcus. I've been a longtime listener of these webinars, so it's a pleasure to be able to get the opportunity to be on this side and to tell you a little bit about some of the things that I've been learning and thinking about in my research over the last few months and how they fit together in this question of what are the inflation risks. So I thought I would start with a little bit of context, and a little bit of an introduction. I mean the bottom line is, of course, the three questions that you just answered are the ones that I'm going to try to give answers to, but it will take me a little bit to get them to get there, and I want to start with a little bit of context of what the inflation –not outlook, but looking back instead– of the last 20 years has been like, because it is easy to forget what the last 20 years have been like. If either you look at the United States over the last century, or you look at the UK, where luckily, we have data for 300 plus years, what is really quite remarkable is how good the last 20 years have been. We have experimented over these 200 years with many monetary regimes. We've had a gold standard, we had mixed standards, pegs, floats, we've had Bretton Woods. We've had attempted pegging exchange rates during the exchange rate mechanism system in Europe, and likewise in the US again, Bretton Woods, we've had the interwar period from the founding of the Fed, and one could do before. And what's really quite striking is how since approximately 1990, maybe 2000, depending on where you want to put that line, inflation has been remarkably stable and very close to 2% whether it looks at the US or the UK it's not just that it's been low, on average, but also low as a standard deviation. How remarkable is this? A few years ago, there was the anniversary of the 20 years of independence of the Bank of England and I've made this following chart. Let's look at 400 years of UK inflation history and look at what was average in the volatility of inflation and the average inflation for every 20 year period. And look how remarkable the 20 years the Bank of England have been in terms of delivering both stable and low inflation in the sense of close to 2%. Now: how did we achieve this? I would say that we achieved this through a combination of three pillars. This remarkable success of this regime, let's call it as such, this inflation regime, this monetary regime, that allows these outcomes have three pillars. The first one was independent central banks, that would not be subject to pressures to either create booms during election years, inflate away the debt or pursue other goals that would undermine the credibility, or even the ability to sustain high inflation. Together with giving independence over such an important policy to unelected policy makers came an extremely narrow mandate focused on inflation targeting.

12:40

And finally, thirdly, it was the use of the short term interest rate as the main tool of monetary policy set in a very transparent and predictable way with a remarkable amount of communication, and even if not following a rule, not straying too far from what would be what would come out of models and others in order to achieve this outcome. Now, the last decade to decade pre-pandemic came with four deviations within the regime, although all still included that regime. First, the fall in low equitable interest rates colorfully often called r^* lead to central banks

using not just short term interest rates, but also trying to very actively affect longer term interest rates in order to keep inflation under control, and this is what is sometimes called a going long policy and it combines forward guidance, quantitative easing, and others. Secondly, central banks are enjoying a capital of inattention. After their success people stop paying attention to inflation. Expectations became anchored, Central Bank became credible, indexation clauses have disappeared, a little bit all over the advanced economies as people simply believe that inflation should be 2%, so there's no point paying attention to it, we trust that the Central Bank delivers. There was a shift in a way to activity, following the global financial crisis. Understandably, since after the global financial crisis, inflation stayed in control, but we had a slow and unequal recovery from it insofar as it took many years to go back to pre-trend, and on top of it— not just pre-trend, to the level. In some ways, we haven't even reached the trend and this all came with an increase in inequality. And finally, there has been a shift towards thinking of the Central Bank more in terms of its role as generating financial stability in order to prevent any crashes and normal evolution that arose from the great financial crisis. Central banks as supporting markets, as providing a safety net in the global system through things like the Central Bank swap lines, and especially, of the centrality of the US treasuries market to the entire global financial system that we require. So this is where we were when the pandemic hit. That was the monitor regime; an extremely successful regime that at the same time had three pillars, but also had space for some movements, and these were the very understandable movements of the last decade. 2020 came with a pandemic, and how did those four deviations help in guiding monetary policy within that regime. Going long was very clear. Sharply, decisively, central banks, and especially the Federal Reserve, made commitments to keep interest rates very low for a very long time and balloon its balance sheet by buying a series of long term government securities. The capital of inattention was perhaps eroded, but definitely used. Expectation stayed remarkably anchored in 2020 even as the economy had deflation, associated with a closing down of businesses and some staying open to try serve customers and try to attract them. The focus was on real activity on the recession, no one was talking about inflation in 2020, even though we had, as Markus noted, even some whipsaw possible dynamics of it. Because if real activity was the focus, getting the economy back at work and the Phillips curve proved to be flat, insofar as we have gigantic movements in real activity with modest movements and inflation, very associated with inattention. The shift of weight to real activity meant that central banks and the Federal Reserve, in particular, since I will be focusing on the Federal Reserve, as well as the ECB, supported strong stimulus, threw the entire kitchen sink at preventing the recession would persist and would create scars. And if erring, erring would be on the side of doing more, of doing too much, rather than doing too little to prevent so. And the financial dominance if you want, or financial concern perhaps came with a very quick layout of liquidity facilities for looks at 2020 and compared even to 2007, it's remarkable how large, how quick it was with the novel support of the treasuries market and with a very fast expansion of the nagra swap lines, as well as the repo facilities in orders for the global reach of the Fed.

17:06

I think, looking at this response within those pillars and with those changes, I think it is fair to say it was a success, inflation stayed anchored and the Fed— we did not have neither a financial crisis nor possibly a recession as strong as we could have had. 2021 though came with a challenge, and came with the risks, and the rest of this talk will be talking about. 2021, in the first half came with many upward pressures on inflation. On the one hand, those upward pressures are a sign of the success of 2020. Because the recovery, the recession was short and the recovery was robust, that put pressure on inflation through standard, if you want, Phillips curve dynamics. At the same time, it came because this recession was not the same as the one from 12 years ago, and was not coming with a financial crisis. And you would think that this was not an aggregate demand shock rather is best understood as having a much faster

recovery. About a year and a half ago, I called it an ABC recession, to emphasize that it was really about closing down the economy for a little bit and reopening it and that intertemporal substitution across time made it possible to have a very fast recovery. Third, all the savings from the checks sent to people in the stimulus programs led to elevated monetary aggregates as those people deposited their checks in banks, and those checks and those deposits are now chasing goods. We had a very large fiscal stimulus at the beginning of 2021 in the United States, and this whole expansion of aggregate demand from these first two factors came with supply disruptions and bottlenecks and an increase in prices. Finally, we may say that even potentially concerns about the public debt may have also been behind some movement in expectations of inflation. Throughout, the Federal Reserve kept very expansionary monetary policy. Now, looking today to help with the benefit of insight, and look at how many upper pressures there were, maybe, just maybe, we may say we did a little too much by being too focused on the financial stability and on the scars of a recession that was different this time around, as well as again on emphasizing too much financial stability and underestimating or under-looking at the role of monetary aggregates, as well as erring on the side of too much with fiscal stimulus. At the same time, given a focus on average inflation and the balance of risks, which was clear, I think it is certainly consistent with the success that I was describing all the way from 2020. One looks though at the second half of 2021 then one starts seeing what is arguably a mistake. And I have, I have come to think about this regime as, which is very well exemplified by the always landmark Jackson hole speech by chair Paul by the Fed towards the end of the summer, which is quite remarkably fun to those who read it now because it says very strong defense of how inflation is not going to go up. Which now, of course, the benefit of insight seems to clearly have been off the mark, where the data was mixed the Federal Reserve was seeing the roses, but not the Gray areas. Why, why is it in the second half the Federal Reserve embraced that “no pasa nada” for nothing’s going on, when it came to inflation in the United States. Maybe it was groupthink, with a pandemic, it also meant that the Federal Reserve didn’t have as many visitors like Markus coming in and questioning its assumptions. Maybe it was a focus on the last battle, on the 2010 battle, and trying to think that it was the same when in fact it was quite different, as I argued. Maybe it was too much of a fear of causing any financial crisis and that any change in any tightening of policy would have some bad impact on the financial sector. Or maybe it was just the polarization of public debate in the United States, reflecting itself and affecting also debate on monetary policy and you start having people calling themselves team X or team Y in replacement for a colder look at the data or maybe it was just the political balance of the time. It maybe, just maybe, was just bad luck, maybe just the bad shocks came in, and this was no forecasting air, but rather that still it was clearly I would say, with a benefit of insight, a mistake.

21:29

Inflation was rising, and again, in July 2021, looking at the blue and the red line measures of inflation, the Fed was saying “no not much is going on.” Measuring inflation is hard, one needs to extract pre-inflation things out relative prices because that’s what’s monetary policy, that’s what changing the value of the dollar is, but if one looks at the data and tries to have not a rosy no pasa nada view, but more unbiased view that weighs the different risks, one would have said that the second half was clearly a time when inflation was getting out of control, like was it expectations and at the time when I read the Jay Powell speech, I really was scratching my eyes, because the following week, I was giving this presentation at the Brookings panel where I was noticing that when I looked at the dispersion of reservations that Markus referred to in the introduction. When we looked at the beginning of January and move throughout 2021, we saw maybe not much of a change, a little bit of fear in the right tail, but when we looked at June of ‘21, already we saw a very clear shift in distribution to the right, especially with a very worrying increase in the right tail. And indeed, as often happens, that fattening of the right tail came very quickly with an increase in the median expected inflation afterwards. This, I argued, reminded

me scarily of the late 1960s, because in looking at what happened in the late 1960s, '67, '70, '74, we saw a fairly similar (qualitatively at least) dynamics that is looking just at the median and saying there is no pasa Nada was the mistake in the end, look instead of dispersion of expectations measured by the standard deviations which skewness would have revealed what was going on.

Markus Brunnermeier: Ricardo can ask a quick question. It seems like this double or triple hump shape, is this a solid finding, or was it because of the method.

Ricardo Reis: That's kinda simply because of the method, I mean the answers come in bins. Often people answer in bins and someone tries to put a distribution which ends up with these little hump showing just from the estimator so there's nothing.

Markus Brunnermeier: Coming to your group thing, of course, there were warning signs, you know coming from Charles Goodhart's book and others and on Larry Summers so it's there was some debate.

Ricardo Reis: Absolutely. I agree, I mean I was certainly very active starting around the buying two years ago, and some others were but yeah I think it's a good question for financial historians of why they take so long, or maybe like I said it's not like there was an overwhelming consensus, and maybe some people just got lucky, and some people got bad luck in terms of their forecasts. But to conclude on this, what about in policy setting and there it was very clear, I mean the Atlanta Fed (anyone can do this very easily, just Google Atlanta Fed Taylor rule), calculate simple— remember a very important part of the last 20 years of monetary regime was even if not following a strict rule, at least being somewhat close to a predictable path for interest rate policy. The Atlanta Fed builds this heat map, showing how high your interest rates are relative to two different models of that predictability. What I like about it is that they have six colors in terms of whether the policy is too tight or too loose. Too loose in their higher color comes if the deviation is 1.5. These are the deviations of the last quarter, thousand one. They should have come up with more colors, they ran out of colors because there were several orders beyond what policy might have been advised. And note how throughout 2021 likewise when looking at either short term rates or, again, at the impact of the actions of the Federal Reserve on its balance sheet of complete steady increase with no retreat whatsoever, finally, after the six months came a month ago, the pivot.

25:24

In my view, six months too late. The consequence is that inflation will be high in 2022. That is, though, a very interesting debate that I'm sure will occupy monetary historians for many years, which is to distinguish between two hard to distinguish accounts and one certainly already sees attempts at I guess, as one would say today, controlling the narrative. Was it that the inflation shock turned out to be persistent? it was a transfer shot, we thought it turned out to be persistent? Consistent with bad luck, or was it six months of delayed monetary policy that made it persistent, precisely because of the inaction of monetary policy. That is the situation which we are in now; let us now look into the future. And it was important to go through this overview, not just of the regime, but also have the changes in those. The regime was really not challenged in 2020. The regime was challenged in the last six months, that was a deviation from the regime, a short lived one and, hopefully, a short lived one that doesn't come with more consequences, but what are then the risks beyond now.

Markus Brunnermeier: Ricardo, can I just ask, because of course the Fed has changed the monetary policy regime moving to a flexible average inflation targeting, and also putting more

weight on unemployment. Is it that the Atlanta Fed does not include these changes, is this new thing?

Ricardo Reis: So, in terms of how I define the regime in a very broad sense, in terms of these three pillars, the changes the Fed has done, are still within that regime as I defined it here. Of course, one can make a narrower more sharp definition regime and in that case certainly there was some change. So that's the first point and that's what I meant by the regime in that context and note how again these changes, these responses that I did, fit within the regime, although they would not fit into other regimes. You mentioned precisely the shifting way to relax activity, the average targeting which you can put into the exploring if you want, the inattention that all we need is to get it on average not get it every period, so those will be consistent with these changes that I put too, but which I was arguing but labeling as still staying within the same regime. As for these rules, you can change them if there are a bunch of different ones. These are still using estimated rules from the literature, but the deviation is so very large Markus that it's hard to get back into the 1.5 where the green even starts thinking of changing color. Now, what are the risks now, beyond 2022? First comes the more likely scenario and luckily here I don't have to spend too much time in this forum because the more likely scenario is the one that was presented in this same place. I think one week ago, maybe six days ago when Alan Blinder went through the history of the Federal Reserve and reminded us, certainly reminded me, of how remarkably successful this institution has been in the past at engineering soft landings. That is, at coming from situations such as the one where we're here with inflation risk is elevated and being able to access just the right path of a tightening of policy in a way that means that we end up with— as I said it higher inflation for 2022 is already a lost cause, but then at least by 2023 and '24 he would have been stabilized.

28:44

Ricardo Reis: If that is what happens, and I am perhaps very much influenced by Alan Blinder's presentation, I think that that may well be the more likely scenario, then the mistake of trying to H2 will likely be forgotten or discussed only academically. There is a second scenario, though, and actually even the third scenario, there's three. Second scenario is instead that, and here I go back to again this paper I gave with Brookings, which is very much focused on this, and since I mentioned Alan here in agreement, I'll mention them in disagreement, so you can read this discussion for a slightly different perspective. To me, it reminds me a lot of the scenario of what happened in the late 1960s in the United States. In the late 1960s, inflation, the green line here, after 15 years of remarkable stability started accelerating. The Federal Reserve raised interest rates modestly, with a delay, you can do the regression in your head. Blue on green coefficient was definitely less than one, and indeed reverted very quickly as soon as inflation would come down, for it was very worried that not much would happen to unemployment. Then, finally, in 1969, the Federal Reserve got scared about inflation, raised interest rates, finally sharply, and the result of spending three years delaying was a recession in 1970, the 1969-70 recessions. The reason why I was reminded of this is that, like so many other macroeconomists, I have come to rely on the seminal work of Christina and David Romer, identifying when do we see exogenous monetary policy shocks, when we see monetary policy really tightening in very sharp ways, and one of the main ones of those was the '69 one. That is that, after I let expectations drift, the Federal Reserve hit the brakes too late and caused a recession that, if we look back now in time, was in some ways, really, the mistake of '65-'68 and a needless recession. Doing that historical analogy, the Federal Reserve may have risked a recession for 2023-24 if it fails a soft landing, that is the consequence. But there is a third scenario which, instead of being what is most likely, instead of being the danger, I will call the panic. And going back to the 1960s it's, of course, that after anchoring, some bad shocks happen; the oil shocks early, the end of Bretton Woods, and we ended up with an anchored very high inflation for not a decade, but almost a decade throughout the 1970s. Let us call this an inflation disaster, and

note that that inflation disaster comes – I love the speech by Mark Arthur Burns where guess what, he starts talking about psychological environments and defending wage and price controls as a policy to stop that (a pulse, it turned out to be not successful at all), and also that it was the drifting of the anchor before the oil shocks that actually led to the high inflation. It was then that indexation of which contract spread, it was the mistake that came after that led to the disaster, so the question I want to ask now is what is the likelihood that we have that inflation disaster. I think this is the most likely: look at Alan Blinder's talk to argue this; I think this is the real danger, a normal danger, a mistake danger; but I want to spend the next 10 minutes on this third scenario, to what extent we have a disaster on the way.

Markus Brunnermeier: We kind of, can I ask a question? Philipp Hartman asked a question, when you know the earlier part when you said or looking at the Taylor rule, they all the red lights lighting up, he said "shouldn't you use inflation forecasts, rather than the current inflation to apply Taylor Rule and I can make a mistake in the inflation forecast this way, but how would you respond?"

32:35

Ricardo Reis: To that first of all I would disagree, but I think Philipp would agree as well with saying you should use the inflation forecast, you may use inflation forecast, that's one version of the Taylor rule and one that is certainly defensible. Then when looking at those forecasts, it depends. Philipp, if we want to plug in the people's forecast, here's what it is: it's at 5% in the United States, so no you're not going to get a very different answer. If you're going to look at the Federal Reserve's forecasts of where things are over the next three years, then sure you're still green, but not as darkly green. This is certainly a point, and this is the point that I think Markus made effectively in the introduction, a point of great uncertainty about inflation and so, in that sense, I worry about that point being another version of the no pasa Nada. Yes, there are versions of the Taylor rule where there's nothing, you can see only roses, but you can also see a lot of green depending on some other measures and one should not– one has to look at all.

Markus Brunnermeier: So let me ask you another question, concerning when the Fed makes the forecast, do they implicitly assume the anchor is not breaking?

Ricardo Reis: Well, first of all, I think you have to ask the Federal Reserve that, not me. But it would be strange if they did, I mean, if the anchor breaks you're admitting that you have failed, you've admitted that you've lost the monetary policy regime. That would be a strange assumption to make, so I think the Fed absolutely should be assuming that it keeps inflation anchored. Now, what is the likelihood of an inflation disaster? One way to look at this is to look at a version of a picture that Markus showed, he showed the five year expected inflation from break-evens; let me show instead the five-year five-year, why? Because Markus, when he showed the zero to five years well, much of that may just be transitory transitory, as I told you well, the last at least a couple of years or a year and a half now will be contaminated by those fluctuations so let's look instead at the five-year five-years, why? Because in five years, even with the varying definitions of what transitory means that we've seen the last few months, I think most would agree that that's not transitory anymore by 2027. And by averaging over the following five years, from today's perspective, '27 to '32, we are averaging enough such that it's not just one year. Now, if you look at that five-year five-year rate, Markus noted that you also see a whipsaw movement or an increase, but at the same time, you see a relative stability in this. You say no big concern, but this does not answer the question I asked: what is the likelihood of an inflation disaster? To answer that question, I recently–it's the paper with the Jens Hilscher and Alon Raviv, asking precisely what we what I think is the relevant question for

that third scenario, what is the current market perceived probability, so that I can build a counterpart for this, that the probably there will be a disaster, which I'm going to interpret as I put in the questions on the poll, that average inflation will be on average about 4% between five years and 10 years from now? You can build this also for inflation below zero percent. Between five years from now, there'll be a low inflation disaster as opposed to a high inflation disaster, and can we build a counterpart to this picture that looks at. Note that if you want to ask this question, you may, as Markus alluded to in the introduction, look at service of households, that is a very legitimate way of doing it. A second way of doing it would be let's look at empirical distributions of inflation and calculate inflation at risk from things like quantile regressions and there's great work being done by many people, David Lopez-Salido, Philip Andrade, and many others trying to do that. A third way would be to build a model and say if your model predicts an inflation disaster or not. I'm going to take this fourth approach, all of which are hopefully complimentary to see what the markets think, what is being expected now from here. And the way to do it is to use option prices. Why? Because option prices are precisely when traders reveal what they think about the options. Think about a very simple world in which inflation was normal in 2020 and then there are three possibilities. We may end up staying normal very, very likely, with a somewhat small probability we end up with moderately high inflation, and with a really small probability, we have a disaster in inflation. What does an option that pays \$1 if you have a disaster period one sell for? Well, the price of that option is the probability that we got that disaster p_n (oh, sorry about that "n," that's that's a typo) discounted by the stochastic discount factor, the marginal utility of consumption in that state of the world. And finally, because that pays you a dollar, what you really care about as a unit of consumption is that you can build so you have to divide by the gross inflation rate or if inflation is in logs take the expectation of minus π D.

37:30

From this, one can build and, indeed, one can, with a Bloomberg terminal, one can build a particular probability. Why, because these a 's are going to add up to the inverse of the interest rate across all states; why, because buying what each of these for each of the three states would give you one dollar for sure tomorrow. As a result, that's the same as the normal interest rate, so if you multiply this by the nominal interest rate you end up with something that's positive and adds to one, (so it doesn't add up to the interest rate) adds to one once you've multiplied by $\exp(i(t))$. That is a certain conventional way of doing things. For instance, the Minneapolis Fed has for some years in its website been reporting these n probabilities. How does one measure them? Well, it looks at data from inflation options with different strike prices, measures the sensitivity of strike prices. However, these, sadly, do not answer our question as well, and they do not answer it for three important reasons. First, if I do this for the five year or 10 year options, I don't get my five-year five-year. And it's important to get a five-year five-year. Why? Because either you're going to be contaminated by the transitory or you're going to be contaminated by the fact that sluggish inflation is sluggish even entering a disaster. p_n is much bigger than P_n . The best example of this is or the clear proof that this is a concern is the 10 year tale disaster probability from options is always above the five year, actually up until a few months ago. Showing you that there's a bigger risk that we build up to a disaster than that we jumped with disaster exactly. Precisely what happened in the 70s, where we're actually building up to it for over a few years before the disaster set it. Second, these are risk-adjusted probabilities; one needs to adjust them for risk, and that is important because we're talking about disasters and in disasters, we think that possibly there's going to be potentially elevated risk premia. And then, finally, and perhaps more strikingly, even if there was risk neutrality (so this was one), these option prices, these probabilities calculated from the standard formula are incorrect and they're incorrect because the option that pays you one dollar is not an Arrow-Debreu security that pays you one unit of consumption, but one unit of consumption is worth less when there's— sorry \$1 is

worth less units of consumption than when inflation is high. Let me show you what those adjustments matter. When the option pays a dollar, the dollar is worth less, because of that, the option is less valuable than a naïve researcher might think, the traders are going to pay a lower price for it and therefore you will severely understand the probability when you look at the tails over long horizons. So this is me creating or Jens Hilscher and Alon Raviv showing you some of the distributions once you just do this adjustment, and these are quite different by a factor of 1.3 on the right tail in fact 0.6 on the Left tail, relative the ones that people with traditionally may show you from.

Markus Brunnermeier: So Ricardo, can I ask? So, the two effects go in the opposite directions. If it affects go in a disaster, the marginal utility is higher, but the extra dollar is worth less no?

Ricardo Reis: Let me tell you about the three adjustments. Adjustment number one is that this one pushes up, the probabilities of high inflation, and pushes down those of deflation. Because what's worth more, I'll tell you more about the risk in the next slide Markus. What do we see in the distributions if all you do is that adjustment, so these are still risk adjusted distributions. Well, what one sees the amazing success of the Federal Reserve in the last 10 years, starting from out of the global asset crisis, the blue line with quite a bit of upside risk, and some downside risk. The Federal Reserve before the pandemic had anchored expectations with a much lower standard deviation, very little tail risk, very sharply, close to 2%. 2% plus a risk premium, a quite remarkable success. At the same time, one sees in 2020- '21 a drift of the distributions to the right, something that I will be talking about much more soon. What about the second adjustment, the one that Markus noted. In a high inflation time, then margin utils are going to be high, inflation can be overstated. Well, we try to—we use the technologies and the tools developed for output disasters in the lecture that Robert Barrow spearheaded in the last 12 years to the same for inflation disasters. And you end up, indeed Marcus, with an adjustment that, for high inflation, is significant. Risk from inflation that, unlike the usual 0.2 found in literature, is 0.5. At the same time, though, and very interestingly, the inflation risk premium for low inflation, deflation, is actually quite small. Why is that? Because historically in the last 130 years we've often had deflation, without any recession or inflation is very low. And finally comes a third adjustment for the persistence of inflation. And where, in the interest of time, I'll go fast here, well, let me just jump the results, but you have to adjust for persistence. Both the fall and stochastic volatility inflation, the green line, but also the persistence of it.

Markus Brunnermeier: Ricardo can I ask a question?

42:35

Ricardo Reis: With all those adjustments, let me, I want, let me show you that the cake, the cherry on the cake, because all this work was to show this one picture and then we can do your question, which is what is then the probability of a high inflation disaster, the question in your poll. Here it is for the United States. I'll talk about the eurozone in the next seven minutes so let's just focus on the blue line. I'll come back to the red line after. What is quite remarkable—that probability fight extended all the way to 2010 was always around zero basically, and you probably want to ignore this point because when markets are closed and it's just one month. What is quite striking is how, starting in 2021, there's been a dramatic drift of this probability of inflation disaster. In your poll, it was 29% of the people who thought that it was between 10 and 20%. The median, they turn out to be right, or not right, this is what market traders in the option say as of November, they point to a probability of 17%. That is, in a sense, I would say, shockingly high because five-year five-year, in a sense, is a measure of the credibility of your inflation regime. At the same time, far from inevitably high, but that is the answer to the first

question. I was surprised before I did this work, I would not have said 10-20%, let's think through what this means, this is a 17% probability that in five years we'll have something like the 1970s, I would think this is much that this should be and was much, much lower. Good time for a question Markus, before I go on. Next I'll talk about the eurozone and then about the cost of it.

Markus Brunnermeier: Just methodologically, I mean so when you talk about an inflation disaster, you always assign it to the big decline in GDP, because marginal utility is very high.

Ricardo Reis: Indeed.

Markus Brunnermeier: But I can also imagine an inflation disaster, but you know there's high pressure, the economy and GDP is doing fine, do you distinguish between the two?

Ricardo Reis: Absolutely, so the big part of calculating this risk premium is precisely realized that some inflation disasters come with output disasters and some do not, and that is why the adjustments for inflation risk premium, Markus, are much lower than the equity risk premium adjustments in the Barro, Gabaix, Liao, and many others' literature. And that is part of what the work does. So these are much lower, because inflation is not as risky, both because the correlation— the two key inputs here are the joint probability you have both an inflation output disaster, as well as by how much output falls, which again in some inflation disasters, that falls a little.

Markus Brunnermeier: So there are some questions from the audience, Charles Steindel and others out there would like to know: in the 70s, if you were to do this for the 70s.

Ricardo Reis: The inflation options market started in 2007. That sorry sorry to interrupt, but that one's immediate.

45:26

Markus Brunnermeier: Essentially, the question is more contrasting supply shocks vs demand shocks or productivity shocks making a huge difference.

Ricardo Reis: I would say, on the supply or demand shocks, you know, this is five years, five years ahead. I, at least, subscribe to the view taught to me by my many, many monetary teachers over the years that if you look at a longer horizon ultimately inflation is about monetary policy. Supply shocks— even the word the way you phrase that question, Marcus— supply shocks, demand shocks after five years, the shock should have died out and that's precisely what I want to focus on this five year five year and why did all this work of trying to get the five-year five-year and adjusting for the horizon.

Markus Brunnermeier: I was wondering if you can use a correlation between the bond and the stock market to figure out what the market thinks about whether we face the future demand or supply shocks.

Ricardo Reis: One could, absolutely. There's great work, Carolyn Fugler is the one that I think I've read more recently, and others who try to do precisely this.

Markus Brunnermeier: The other thing, I would like to throw at you, is you know this option market is feeling illiquid. Do you take care of them, liquidity problems, and how? It must be...

Ricardo Reis: First of all, the inflation options market is not that illiquid. We're starting in 2010 you can argue in 2010, but it became relatively relevant, meaning it's traded. There's quite a few, but I forget how many billions of the volume but it's not that small. Why not, because you have large pension funds in life insurance who are hedging their long term social risk more relevantly, Marcus, insofar as one has, as you showed an active tips market and nominal marketing people and breakeven, this is just a counterpart of hedging, hedging risk from that market and, as a result you do get quite a bit of trade. Secondly, though. It is noisy data, this is not the right place, although I refer to the paper which should be on my website tomorrow morning or already is, I already sent it to my website this morning. We try to be very careful with this data, while it's daily we only do it monthly by essentially combining/using the data from different days and trying to be very conservative and using only ones that satisfied put call parity type conditions and that rule out clear outliers and so we try to do the best week can, but certainly when it can always argue. My perspective is that, when one looks at these things, liquidity problems (I'm sorry) would tell you, yeah don't look at day to day movements, but we're looking here over a couple of years and if you worried that I didn't get quite the risk premiums right, then you say, well, maybe the expected value in the five and five isn't right, but the probability still will not be too far off. So let's talk about the Euro area because...

Markus Brunnermeier: So there's one intervention by Enrico Perotti, he says, all supply shocks can be long lasting if you know, going back to Charles Goddard's thing that might be long lasting supply angels coming from the globalization or lack of globalization or climate change...

48:17

Ricardo Reis: Absolutely, but in the long run, you would think that any long run supply shock and therefore once we get to the long run, it's stopping— the shock stops being something we predicted, would be offset by a change in monetary policy that will be consistent with this and therefore— and, as a result, ultimately, if it is that long run, then it becomes predictable and then monetary policy can adjust to it in order to keep inflation on target. Let's talk about the euro area, because it's actually quite interesting how different it is, though I already gave it away. It's well you already saw it's different. First of all, not much, nothing like what we've seen in the U.S. in the last 12 months, but let me elaborate a little more. In the euro area, we had a great challenge in 2013, '14, '16, which was that between 2013 and 14 we went from the blue to the red line and i'm showing you already like the outputs of my paper— of our paper— with Hilscher and Raviv, we have the shift of the median to the left a fall in the five-year five-year rate, because after all this is always anchored by the five-year five-year, which was at the time, one of the arguments for why QE had to be started in order to re-anchor. Look at this distribution, what's quite striking and doing the right adjustments of the tales that I told you need to do. What's quite striking is how, in some ways we failed in the sense that the distribution— or we succeeded in eliminating high inflation risk— but it became an anchor distribution now at a much lower level. Something that has been already very argued and notably led to the mission review of the ECB of trying to re-anchor within the regime shift the large regime to re-anchor green lines further to the right. The pandemic...

Markus Brunnermeier: But the target, it was not 2% at that time.

Ricardo Reis: Absolutely, that's right so now, the change of regime, precisely to try to— let's not say re-anchor— change the anchor and put an anchor that's closer to 2% now. What happened with the pandemic? We saw very qualitatively similar to the U.S., a shift to the right, although only by November, which is the last data point I have, did it finally cross 2% so in some ways, not necessarily, still just anchoring at the new anchor. Okay, but here is, though, what is more

striking about the Euro area. In blue comes again my five-year five-year, but now, on the other side, on the deflation, as opposed to the high inflation. In green comes not the five year five year, but the 0-5, and the red is serious minus 1% inflation but focus on the blue and green for here. QE and all the policies of the ECB in the last few years have convinced markets because all we're talking about is market perceptions that, indeed, the ECB was able to put down and eliminate the fear that deflation would be there in the next few years. But—to reduce the deflation trap of the next, deflation risk of the last few years— but the risk that we will be stuck into deflation trap in the five-year five-year horizon remains high, and if anything is due to be elevated, including throughout 2021. I don't even show you the U.S. one, because in the U.S. it already— it's essentially been a flatline since 2013 or '14. That is, and this leads to the second question in the poll, it turns out that in the euro area according to market option prices, the fear is not that the ECB is going to let inflation go out of control, there's a bigger fear that we will be stuck in a deflation trap. In other words, the euro area's challenge according, again, to the perceptions of these inflation risks is somewhere caught between the U.S. in 2021 and Japan, 2001. On the one hand there's upwards pressures on inflation, even if they are small, even if we had a smaller increase it's much more driven by energy and less broad base, started from a lower point, and there was a desire to move inflation well to the previous five years, change the anchor to 2%. So while there's a similar danger of being too slow, there's still not a mistake in the sense that they're worse in the six months, the last six months of the Federal Reserve. At the same time, though, there's a downward pressure on inflation like Japan in —sorry, not 2011—2001. Strategy review affirms the desire to average at 2% but at the same time as soon as we cross it, a much too— potentially a much too swift tightening, that's what happened in Japan 20 years ago and expectations that stays anchored and zero to 1% for two decades. That is, the ECB challenge is a bigger one in some regards, because it has both this deflation trap perception in markets that seems to be there in spite of strategy reviews and others while at the same time having the same risk, as the United States, and I would add, also an institutional weakness of having fragmented public debt markets, a lack of a European safe asset, like, for instance, the sovereign backed securities that Markus Brunnermeier has proposed for a few years and, as a result, an extremely difficult challenge for the ECB in controlling these two sided risks. So your poll said 60% deflation, 40% inflation or something like that, and in some ways, your audience is— well, your audience was spot on in terms of at least what my views and in terms of putting a higher level of deflation, that is certainly what the markets are saying. Questions on that, if not I'm going to go to the last part. Let me go to the last part which is, let me make a final point in the remaining five to 10 minutes of this seminar, having answered your questions about inflation risk but going at least from the perceptions of markets let's talk about, but is this so bad? What's wrong with...

54:04

Markus Brunnermeier: Can we ask again, to what extent are these numbers affected, what assets the ECB is buying or if you buy mostly nominal bonds and not inflation protected bonds, you distort the whole price signal.

Ricardo Reis: Absolutely

Markus Brunnermeier: And it will also feed into the swap in the options market too.

Ricardo Reis: It's absolutely the case that the intervention of central banks in these markets has consequences that must spread, even if only through no arbitrage conditions to all of these signals. I would say— so that's absolutely the case and that is important— we can argue, to what extent they are, how distorted they are or are not insofar as, ultimately, you are making bets in

markets and you want to be right, or you want to be wrong, sorry you don't want to be wrong, you want to be right sorry that's but certainly...

Markus Brunnermeier: Can we put another correction factor, so just looking at data, how many normal bonds the ECB buys and how many TIPS bonds these up buys and then there's somehow another correction factor coming up. I don't know how to do it, maybe.

Ricardo Reis: I don't know how to do it, but maybe I don't know how to do it because you have to measure the distortion and like I was saying, what I know of is an active debate in literature on how much that distortion is there, or not, and you asked me for relative distortions across two asset classes, that may be different between the eurozone in the US so that's two first two differences relative to a level that I don't know quite how to estimate so maybe, yes, but maybe.

Markus Brunnermeier: That might be a big task, so it distorts the price signals and the ECB could even try to manipulate the price signal to make it look in their favor, in a sense. Not saying they would do that, but...

Ricardo Reis: I cannot, I cannot rule that out, I think that's the right thing to say, absolutely. Okay, what's wrong with a little or a lot of inflation, let me give you just one perspective. I think it is fair to say that economists still struggle with what are the costs of inflation, I think you even saw I even struggled with the last slide of Markus's introduction, where he said Oh, the rich have real assets and therefore they suffer less with inflation consistent with a view that also gets quoted a lot that is that inflation is the cruelest tax, that is it's the poor that suffer more but, of course, you know the research that economists have done on this and probably the most important paper that still stands, that people refer is a great paper by Matthias Doepke and Martin Schneider which finds exactly the opposite, that the rich are the ones that lose with inflation, and then the middle class wins. So at least the state of the literature in terms of estimates is exactly the opposite, which I think is just a reflection of what Markus was hinting at, which is that we don't quite understand this, but they very likely have differential effects, which direction is less clear. Now what's— let me focus more on one perspective, which is one perspective that I care about because it's another topic of my research interests. Public debt has been growing remarkably for at least 40 years, certainly the last 20 years across the U.S., advanced economies, and emerging markets. How is that possible? How have you been able to sustain this? Well, we have sustained this in spite of having almost no surpluses, a continuation of deficits and no expected deficits through the remarkable feature that interest rates on the debt have been well below the marginal product of capital in the economy. In other words, bondholders or investors have been able to lend to the U.S. Government, the European governments, and others, charging a very low interest rate relative to the opportunity cost they would have to invest in the economy or alternatively that governments have benefited from borrowing at very low rates and potentially getting high returns from public investments. That has led to what I have called a debt revenue term. The debt has been sustained by some specialness of debt, in providing some flow that allows this debt to be sustained. What makes debt special? That it's safe? It doesn't default? That it's priceless hasn't fluctuated much, and especially not with inflation? That it serves as a collateral that has been used, perhaps by regulation to repress? That has been liquidity? That it has come with bubbles or others? Whether— whatever is the reason it is quite striking how if, when we calculate the size of the size of that revenue, the difference between the green line and the red line which we can measure almost directly, without having to measure the r 's directly, you end up with several percentage

points of GDP such that it is this term that has extended that not this term, which, if anything, keeps on moving in the wrong direction, the blue term.

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Ricardo Reis: Why because, again, while r fell, m stayed high. The gap between the two really increased. Why could that be? Well many reasons, and active literature changes in all of these, but one reason is that perhaps it is not a coincidence, going back to the beginning of my talk, this is also the 20 years of stable inflation. For what is the big risk for someone who buys treasury bonds counting on the U.S., the U.S. Government not defaulting, to give one example is that inflation erodes the value of that. The main risk, the main unsafety of the U.S. debt that permeates across it is the risk of inflation. It is perhaps not a coincidence that the successful monetary regime, the most successful monetary regime we've had in 400 years, is also the regime that has come with a remarkable amount of debt revenues, special debt, that sustains the public debt. But then, if that is the case, let's think about how important it is to keep that commitment to price stability. To keep debt sustainable and remember, we are at absolutely record high levels of debt. If we want to sustain them, the way we did last 20 years, maybe we want to do it somewhere else, maybe we want to run large surpluses, tax the hell out of the population, cut spending, and have massive austerity, but if we want to do it through the specialness of the debt then maybe or not, maybe, then I would argue the commitment to price stability is as or more important than ever. Why? Because committing to price stability, avoiding inflation, is a way to protect the safety of the public debt, remove fears of monetization of that debt. Because committing to price stability anchors inflation rotations and removes the higher interest rates over future debt because it eliminates the risk of volatility of inflation, because high inflation comes with volatile inflation because that reaffirms the focus of inflation for central bank, and therefore steers away macro principles of moving us towards financial repression. Because it guides the balance sheet policy of the Central Bank and therefore controls the extent to which we have fiscal spillovers and fiscal...

1:01:07

Markus Brunnermeier: But Ricardo, if it's all about the inflation risk...

Ricardo Reis: Give me a few minutes Markus, let me conclude, because I need two minutes, just to conclude the argument and then I'll take questions in less than two minutes. And so the price to build a commitment is, in my view, actually from the perspective of sustaining this high debt and thinking, I was to say the last 20 years is actually more important than ever, inflation disasters would be very dangerous, will be very dangerous for that suitability. Is this a risk or benefit? But wait, doesn't inflation help to pay for the debt? Indeed in 2001 debt as a ratio of GDP in the U.S. fell, and why did it fall? Because some of it was the result of the high inflation that we have. Yes, but you can only do so very temporarily because of the unexpected nature of inflation in the last six to 12 months. The U.S. debt maturity is so low today, unlike what it was in the 1940s that any catch of expectations, such as the one that we're seeing already in the last month in the markets and expectations immediately removes all these benefits and you will see a whipsaw here back with a vengeance, so that keeping debt sustainability in the future requires more independence central banks, a stronger case for price stability. Do you want me to conclude and then do questions? Are there questions on this part Markus?

Markus Brunnermeier: I have one question on that part because if you take your argument seriously, and I very much agree, the commitment to price stability, but if it's only about inflation risk is in order to get cheap government funding, you can always issue TIPS, you can issue

inflation protected bonds and you can then, in theory, forget price stability and just say I fund my debt with the TIPS, I cannot do inflation taxes, but I can at least get the low interest rate from the TIPS market. What would you say to that?

Ricardo Reis: So yes, if you want to, but I would reverse the size of this. If we expect that inflation is coming, then bondholders will want to hold more TIPS, they will want to hold more inflation protection. As they do so, then the benefit of inflation disappears right away, then the TIPS would benefit from that specialness. However, know that that specialness comes as well in part with the liquidity collateral, all of those things that treasuries nowadays benefit more than necessarily TIPS per se, although absolutely that would happen, but then, let me add something Markus, and something that I think is relevant, what has happened to the share of issuance of inflation index bonds to nominal bonds. Let me tell you the U.K. fact, because I just happened to know it better, it has increased and quite significantly increased. That is, indeed, we have seen the movement in the issuance of inflation index bonds versus not, which means that the benefits are gone much more than potentially even the costs, consistent precisely with what you said, let me.

Markus Brunnermeier: It changed the last few months, or in the last few years.

Ricardo Reis: In the last 18 months, 18 months since the start of the pandemic. So, actually, by the way, there is a strong correlation in terms of the issuance, as economist Gabor Pinter at the Bank of England has documented, there's a relatively strong correlation between the share of index versus non index bonds and the expected inflation. I tried to make four points in these— sorry for being five minutes over— in this lecture. The last 20-30 years were remarkably successful monetary regimes. Let's not forget that inflation control has not been the norm in 400 years and that we've never had it better. So, before we abandon the current regime, let's remember how incredibly successful it was. 2020 was a success for monetary policy. In the case of the United States, 2021 came with the emergence of a significant upside risk that means that we now need a very deft soft landing to prevent a recession in the near term in the next two to three years. How large then was the risk of instead of either a soft landing or merely, merely a short lived recession '23-'24, what is the risk of a new inflation regime? For the U.S., I would say scarily elevated, but still time to act and to be able to keep the track record of landings. For the eurozone, interestingly, the deflation trap risk still seems quite relevant, in spite of the pandemic, in spite of a strategy review, it's quite striking how the deflation risk is still quite there as perceived by markets. Why is the case for keeping to the old inflation regime even stronger to going back to one, beyond assessing and controlling inflation, because I argued with the incredible amount of debt we have, we need to keep the safety and the specialness of government debt higher so that we can keep on enjoying these debt revenues which gives us even stronger argument for the commitment to price stability and that's what I have to say.

1:06:07

Markus Brunnermeier: Thanks a lot Ricardo, let me ask you a few questions which also came up so one is if you want to have a soft landing, and we know by the Taylor principle you have to move more than one for one to the inflation, would you expect a much higher interest rate increase this year in U.S. than let's say 5, 25 basis points.

Ricardo Reis: So first of all, inflation is very high in the United States now, but some part of it is indeed potentially temporary and transitory, certainly not all deviations from 2%, but some I think will revert just naturally without it, you need to see through that, measure what I call "pure

inflation.” So that's the first point, you shouldn't be putting— oh, I forget now the last reading of inflation, sorry about the numbers— but you shouldn't be putting that much necessarily just in the Taylor Rule, we need to filter a little bit out of it. After you filter a little out of it, note that the Taylor Rule tells you well, or gives you guidance for what you should do, but especially over not in a month, but I would say over a certain period of time. The deft landing, is how quickly you go into that adjustment, even at the same time as some of those temporary shocks adjust and that the speed at which you do that adjustment itself starts bringing inflation down so, is it five, is it eight increases, meaning should interest rates go from their current level to 2%, 1.5, within the next 12 months, I frankly don't know. Here I will trust or no I won't trust. Here, I will say let maybe Alan Blinder has it right, the Fed has a great track record they'll get that amount just right. I admit, I humbly admit, that I don't know exactly what the answer is. It strikes me as from my reading of the 1960s from the research that I've been presenting here that there has to be a significant increase in interest rates over the next 12 months in order to achieve even a soft landing. But I'm also very aware that too hard one will lead to a recession 2023 which I'd really like to avoid. Getting that pace and size right is exactly where the deftness, the agility, comes because it has to be very data dependent over the next 12 months, neither too much, nor too little, certainly more than was being said four months ago, as much as is being expected right now maybe, maybe more.

Markus Brunnermeier: Okay, so let me conclude with a question Robert Owen was asking, I interpret it a little more broadly about global interdependence so is there some global groupthink among the Central Bank Community? So if I compared with the '70s, you see that you know the Fed was moving in one direction, but the Bundesbank was really going the opposite direction, the different schools battling it out. Do we see different movements where some parts of the world move in that direction, the other parts of the world move in different directions? Or actually does everybody have the same model in mind, the same framework in mind that they're all pushing the same direction, just copying each other with a bit of lag because the U.S. is three months ahead of Europe. Where do you see the global plan, would you assign that everybody's doing the same thing? This is following the same rule book essentially, or do you think the last 20 years were so successful, we have now really a good rule book, we should not experiment and try out different things.

1:09:38

Ricardo Reis: It's a great question, for which I don't have a definite answer, so I'll give you three answers instead that are informative in different ways, the first answer is to note the research of several people I remember now Silvia Miranda-Agrippino and H elene Rey and others, noting that today, relative to the 1970s and other times we have very interconnected financial economies, such that risks, such as the risk of high inflation disasters, which ultimately feed into financial risks will spread and propagate across what Sylvia, H elene, and others have called the global financial cycle and therefore there is a reason for why these risks come together in some ways, and in those ways and so as a result, yes, there is a good fundamental reason for there to be not groupthink, but simply a spread of the inflation risks across borders. Number two: note that I just noted how for the Fed and ECB, the challenges are different. I found that when it came to the still risk, what central bankers used to call risk management, focusing more on the tail risk, rather than the expected. Even if, in the expected, the ECB and the Fed may be looking in some ways similar with a three month lag, the tail risks look different. And those certainly justify potentially different monetary policies and I tried to argue that indeed, the ECB's challenge is, and in my opinion it's not just different but also somewhat harder and that would justify potentially somewhat potentially different policies and on top of it, I would add that there's also a third factor, which is that if we end up with very different inflation experiences, of course they will come with inevitably large exchange rate adjustments, large capital flows as they

reflect the different risks of jurisdictions, and that is in itself a source of needing different policies. I'm not sure if it's this, I wouldn't say the same rule book, although I would still argue that within the same inflation regime as I described it because, as there may be a discrepancy across regions, we would end up with potentially very large and dangerous capital flows across areas and certainly in the euro area, we are very sensitive to those insofar as they were and the flight to safety that comes in the absence of safe assets, in this case coming across different borders would come with great instability, and if you want to be even more extreme, Markus, you could talk about if we have an inflation disaster, which I really hope not, in the United States, but not elsewhere, then we would get to start talking about a fascinating topic about the extent to which the dollar would keep on being the hegemony's currency because, of course, a disaster United States and elsewhere should, in principle, lead to steps ahead of the euro and the yuan in becoming more international currencies and then there is phenomenal research by the late Emmanuel Farhi and especially by Matteo Maggiori and many others are noting how that world can end up being a very dangerous one, where the world or unstable one, and certainly an inflation disaster in the U.S. that didn't happen elsewhere, would be one of those fundamentals that could lead to that change in the global financial system, so I don't think I answered the question but hopefully I gave some observations that are useful.

Markus Brunnermeier: They are all pushing the same direction, that it's actually good to have the same framework or similar framework across the globe.

Ricardo Reis: Well, well, the policy regime— it's good that I think the last 30 years tell us it's a good policy regime, within that policy regime, there's many different options. And those different options, insofar as they lead to the same outcome, that would be a good thing, and there's both fundamental reasons as well as dangerous reasons, avoiding dangerous reasons for them to have the same outcome as opposed to the same rulebook.

1:13:36

Markus Brunnermeier: You agree probably if there's an inflation disaster in the U.S., it's not advantageous to have an inflation disaster in Europe or Japan as well...

Ricardo Reis: No

Markus Brunnermeier: You want to control capital.

Ricardo Reis: That's a different scenario than our discussions. A global inflation disaster I did not discuss, no time.

Markus Brunnermeier: Okay, thanks a lot Ricardo, very insightful, we learned a lot and thanks for presenting your paper and launching it here essentially and it was great to have you and continue watching your research on this topic as you're one of the leaders in this space and trying to learn from your activity and I enjoy talking to you all the time.

Ricardo Reis: Thank you for having me.

Markus Brunnermeier: And we will thank everybody again for everybody for hanging out till the end and we will see you soon, again, we have more on inflation coming up, we also more how you should invest if there is high inflation and you want to hedge your inflation risk across different asset classes, so stay tuned and I hope to see you soon again and keep following new economic insights across the globe. Thanks again, bye bye Ricardo.

