Economics of Banking and Finance Markets
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Lecture - 48
Fed Fund Rate and Taylor's rule - II

Welcome to this session. In this session, we will discuss one of the benchmark tools in determining Fed Fund Rate, that is the Taylor Rule.

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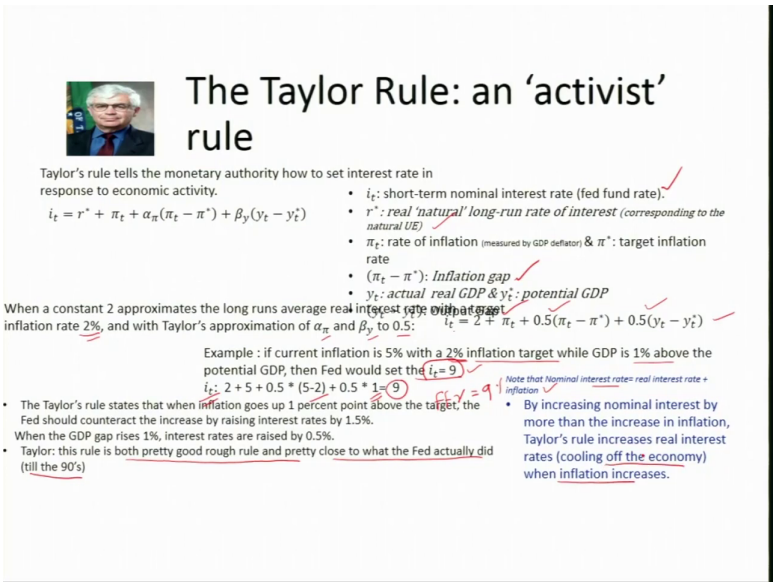

So, the Taylor rule is also known as an activist rule. And as per this rule the Fed Fund Rate is a function of inflationary gap and output gap with appropriate weightage for these parameters. So, this is what we can see here that (Refer Time: 00:47) *it* means the short-term nominal interest rate. So, in our discussion, we know that this one is the Fed Fund Rate, which we have we had discussed in length in the previous sessions.

Then, comes the rate *r**, that is the real natural long-run rate of interest, that is corresponding to a natural unemployment. The concept of natural unemployment and natural output we had discussed in the previous sessions.

Then, the rate of inflation and the target inflation rate and this called the inflation gap, that the π_t minus π^* that is the inflation gap. Then, comes the output gap this is called actual GDP and the potential GDP.

So, what according to John Taylor; when a constant 2 approximates, the long run average real interest rate with the target inflation rate of 2 percentage with the Taylor's approximation of alpha and beta is equal to 0.5. Then, plugging this, this is how the Taylor's rule look like. That means, weightage is 0.5 for output gap and inflation is also 0.5

For example, suppose the current inflation is 5 percentage with any 2-percentage inflation target, that means, the inflation gap is going to be 3 percentage because current inflation is 2 percentage. But the monetary policy authorities, want their target inflation is only 2 percentage, that means, there is certain inflationary pressure. That means, 3 percentage is the gap.

While GDP is 1 percentage above the potential GDP, that also says that the economy is at a boom stage, that means, the current GDP is above 1 percentage above the potential GDP, that the potential GDP means given all its resources at a time normally how much this economy can produce.

So, that means, here GDP is 1 percentage above. It means that the factories of productions are working overtime, laborers are working instead of 8 hours they are working 12 hours or more than that. And the machines normally suppose they normally operate for 12 hours, now they are working for 16 hours or 18 hours like that. That means, because of that the GDP is now 1 percentage above is potential.

Then, according to Taylor's rule, the Fed Fund Rate should be set in a way that currently the economy is facing positive inflation gap and positive GDP gap. Then, accordingly, to cool off the economy the Fed Fund Rate should be high.

It should be as per this formula. It should be 9 percentage, that means, inflation gap and the output gap of 1 and using the appropriate weightage. So, in this case the ffr is equal to it should be 9 percentage according to Taylor's formula, Taylor suggestion. The Taylor rule states that when the inflation goes up 1 percentage point above the target, the Fed should counteract the increase by raising interest rates by 1.5 percentage.

When the GDP gap raises 1 percentage, interest rates are raised by 0.5 percentage. So, here Taylor, according to Taylor, this rule is both a pretty good rough rule and pretty close to what the Fed did till the 1990s. So, until 1990s according to him, the Fed followed almost this rule

until the 1990s. However, later the Fed. according to Taylor, Fed changed from this forecast predictive tool.

So, here are some more things, just to give you an idea always, just to refresh your memory that the nominal interest rate is real interest rate plus inflation. So, by increasing nominal interest by more than the increase in inflation, Taylor's rule increases real interest rates, that means, cooling of the economy when the inflation increases.

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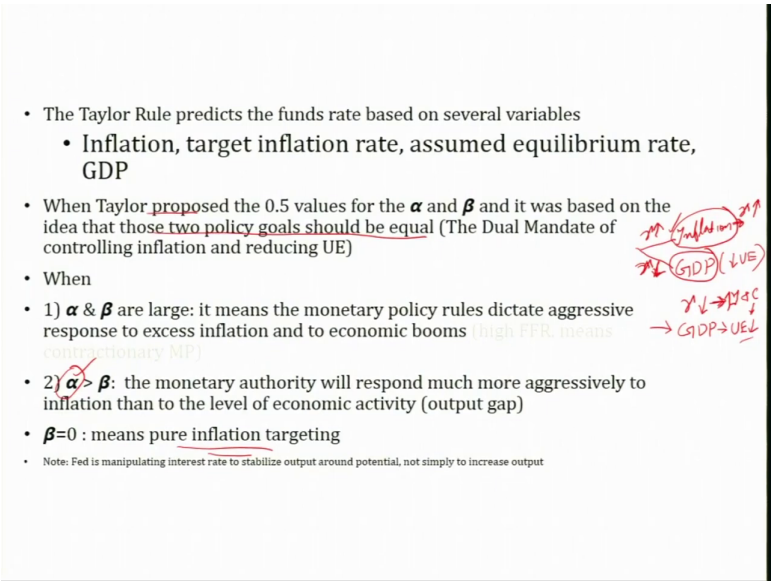

The Taylor rule predicts the fed funds rate based on several variables. So, one you can see here inflation, target inflation rate and assumed equilibrium rate and GDP. So, when Taylor proposed the 0.5 values for alpha and beta, it was based on the idea that those two policy goals should be equal, that is the Dual Mandate of controlling inflation and reducing unemployment.

So, here the Dual Mandate of monetary policy is that there are two things we need to remember. One is to control inflation when economy is experiencing inflationary pressure, that means, there is more money in the economy that the liquidity is more in the economy, then what Fed should do to counter this. If the is the inflation is very high, then in this case the Fed should reduce the liquidity in the economy, that the money supply available in the economy.

So, to do that, Fed should reduce the Fed Fund Rate, that means, the rate of interest should be increased. So, that when the rate of interest increases and you know that the borrowing, the credit become very expensive, credit supply becomes very expensive.

That means, the rate at which for example, member banks can borrow from the Fed, as well as for the public, for the consumers, and for the producers, when the economies interest rate is very high, it will become a costlier proposition for them to borrow from the bank and the market.

So, that means, as a result, the money supply will come down in the economy, that means, there will be reverse flow of money supply that from the banking system, from the public to the banking system, and from the banking system to the Fed.

And overall, more important thing is that when the money supply decrease, the liquidity with the public will go down at this time when there is an inflation. So, that means, money supply will come down when interest rate is increased. Then, as a result the expected line of change is that inflation will go down.

The second mandate is increasing GDP. It also means that reducing unemployment. That means, increasing the GDP means increasing the level of economic activity.

So, if that is the mandate, that is, if they give importance to GDP, increase in GDP; so, to increase GDP, the rate of interest should be reduced, that means, the Fed Fund Rate should be reduced. When the Fed funds rate is reduced, that the rate of interest, the other rate of interest also declines. And as a result, you know that borrowing, the cost of borrowing, the cost of loanable fund will become cheaper.

Then, it will become cheaper, cost of borrowing will become cheaper, credit supply will become cheaper. Then, as a result the investment made by firms will increase. Firms' investment, that the investment by firms and as well as the expenditure by households including consumers, both will increase.

And as a result, the economic activity will be rejuvenated, and as a result there will be increase in GDP, then also there will be decline in unemployment. that is nothing but increasing employment. Then, you know that increasing employment. Then, overall, the per capita income will increase. Then, the level of standard of living of the people will increase.

So, these are the two things. So, but the thing is that we have seen that. If we our objective is to increase GDP, the rate of interest should be reduced, and if our objective is to counter inflation, then the rate of interest should be increased.

So, here is a Dual Mandate, both are contrasting one. If they focus more on controlling inflation, then they must increase rate of interest, that means, as an opportunity cost of increased rate of interest, the cost of borrowing will increase, GDP will decline.

On the other hand, if they focus on GDP, that means also reducing unemployment, then they will reduce rate of interest. But then, you know when reducing rate of interest, the liquidity, that the money supply, in the economy will increase, that would lead to inflation.

So, there is a trade-off in fact. If they target on inflation or in GDP, so accordingly Taylor proposed that giving equal importance to both that is the Dual Mandate of controlling inflation and reducing unemployment, that the equal weight that is 0.5 for alpha and beta.

When alpha and beta are large, that means, it means the monetary policy rules dictate aggressive response to excessive inflation and to economic booms. So, a high Fed Fund Rate means nothing but increasing the rate of interest. That means, it is a contractionary monetary policy, that means, tightening monetary policy.

On the other hand, if alpha is greater than beta, that means, monetary authority will respond much more aggressively to inflation than to the level of economic activity. That means, giving more weight, that alpha, giving more weight to inflation fighting, more aggressively to inflation.

If beta is equal to 0, that means, pure inflation targeting, that means, the monetary policy is purely giving importance to alpha, that means, inflation, no importance to targeting on output at all. So, that means, pure inflation targeting when beta is equal to 0. So, Fed is manipulating interest rate to stabilize output around potential, not simply to increase output.

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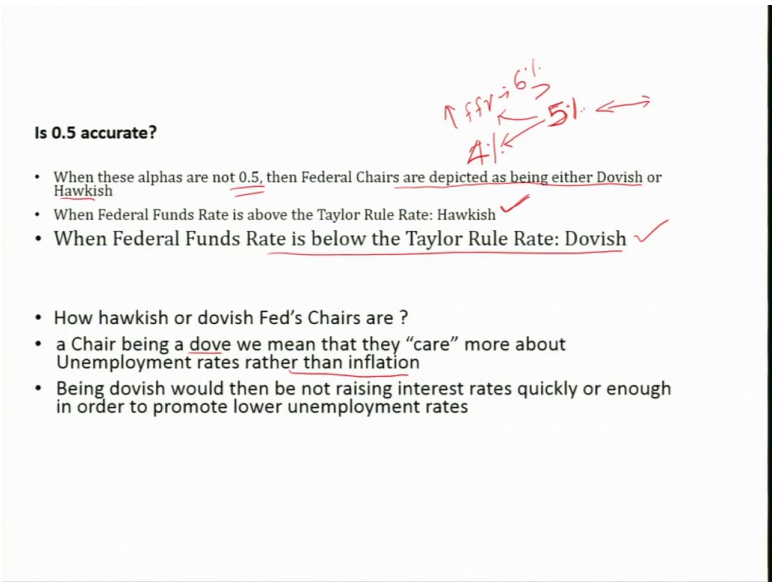

So, the question here is that: is 0.5 accurate? So, it is a debating issue. So, when these alphas are not 0.5, then the chairman of Fed are depicted as being either Dovish or Hawkish. So, what we see here is that based on the inflation gap, you may wonder how we are getting this coefficient.

The idea here is that look at the Fed Fund Rate already determined and then look at the inflation gap and the output gap. Then accordingly, after that when you plug these values, then you will come to know what is the alpha and beta, and at that time we will get know where they are giving more importance, whether to alpha or to beta.

So, when based on this value, suppose this is not 0.5, if they are giving 0.5, or greater than 0.5 or less than 0.5 for example, for alpha or beta, then the federal chair is being depicted as being either Dovish or Hawkish.

So, when Federal Funds Rate is above the Taylor Rule Rate, what are the Taylor Rule Rate predict? Suppose using all the Taylor rule formula, suppose using this formula we are getting for example, 5 percentage, as per Fed Taylor rule.

But, if the actual Fed Fund Rate, this is as per the formula, formula we are getting 5 percentage. But the target Fed Fund Rate fixed by Fed is, for example, 6 percentage, then we know that actually in the Fed Fund Rate is above the Taylor Rule Rate, then in this scenario,

that means, they are increasing the Fed Fund Rate in the economy. That means, this is a contractionary monetary policy.

And in this case, we can call that the Fed is being, Fed chair is being more Hawkish. More Hawkish means they are following a tight monetary policy. That means, reducing the liquidity in the economy, money supply in the economy by increasing Fed Fund Rate, they are fighting against the inflation.

You know that where the Fed Fund Rate increase, interest rate increase, the cost of borrowing for the firms become expensive, and then the GDP will come down, there will be a decline in GDP and employment, right. So, that means, the Fed chair is becoming Hawkish.

When Fed Fund Rate is below the Taylor rule for example, 5 we are getting through Taylor rule. But when suppose then the Fed is targeting the Fed Fund Rate at 4 percentage, then we can call that the Fed chair is being Dovish. That means, they are more following generous, more expansionary, monetary policy by reducing rate of interest, then as a result you know, the rate of interest decline, then investment that investment by firms will increase, GDP will increase.

So, how Hawkish or Dovish Fed chairs are? So, a chair being a dove, we mean that they care more about unemployment rates, more about economic activity and GDP rather than inflation. Then, we can call them dove or being Dovish at that time. So, being Dovish would then be not raising interest rates quickly.

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Here the Jerome Powell, the chair of Fed since 2018. So, based on these two-screen shots, you can see that what former US president was accusing, saying about the chair Jerome Powell, is that he is Hawkish. That means, Hawkish when you care more about inflation than unemployment.

So, here you can read it clearly that United States should not be penalized because we are doing well. So, because here a when the economy activity is well, then as a result what the chair has done is they followed a contractionary monetary policy, that means, increasing the Fed Fund Rate.

So, because of that you know that the investment in the country, that the investment by firms, that is purchasing machines and tools and setting a factory that will come down. So, that means, the president is accusing that Fed chair as being more Hawkish. So, that means, when the when you raise interest rates quickly to fight inflation. So, the opportunity cost here is the decline in investment and other economic activities in the economy.

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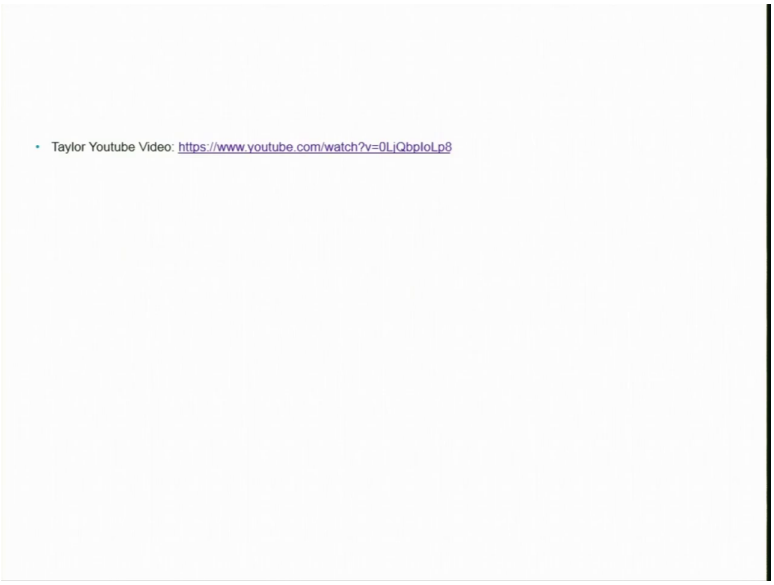

I would suggest you watch a video that is put by Taylor, John Taylor, his own video, that he is explaining what Taylor rule is, is nearly to 3 minutes video. It is freely available in YouTube. You will get a more idea, more insight, what does it mean by the Taylor rule.

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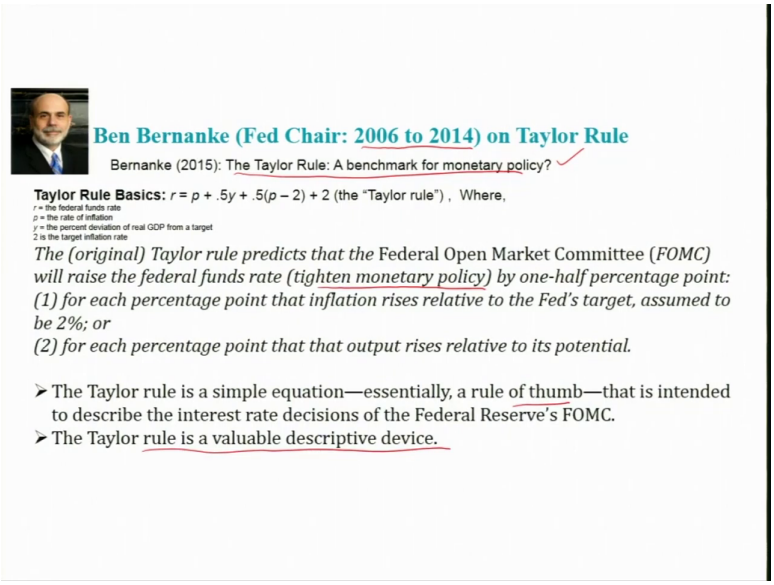

The Taylor rule attracted a lot of criticism as well. One of the sharp critics of Taylor rule was Ben Bernanke. He was the Fed chair of 2006 to 2014. And Ben is also a great academician and researcher who did lots of research especially on 1929 great depression.

You read his article title this one, “Taylor Rule: A Benchmark for Monetary Policy?” Just this is freely available on the web. If you just type this one and you will get this article.

So, Taylor rule, I am just giving you, reproducing the Taylor rule basics here. His point is that the original Taylor rule predicts that FOMC will raise Fed Fund Rate, that means, increase in the Fed Fund Rate is nothing, but tightening monetary policy by one-half percentage point.

So, for each percentage point that inflation rises relative to Fed’s target assumed to be 2 percentage. And for each percentage point that the that output rises relative to its potential. So, Ben in his article states that, Taylor rule is a simple equation, essentially a rule of thumb that is intended to describe the interest rate decisions of the Federal Reserve FOMC.

So, according to Ben here, he clearly states that a Taylor rule is a valuable descriptive device because it brings all the complicated aspects in an economy to a simple formula and make it really make it as a more valuable descriptive device.

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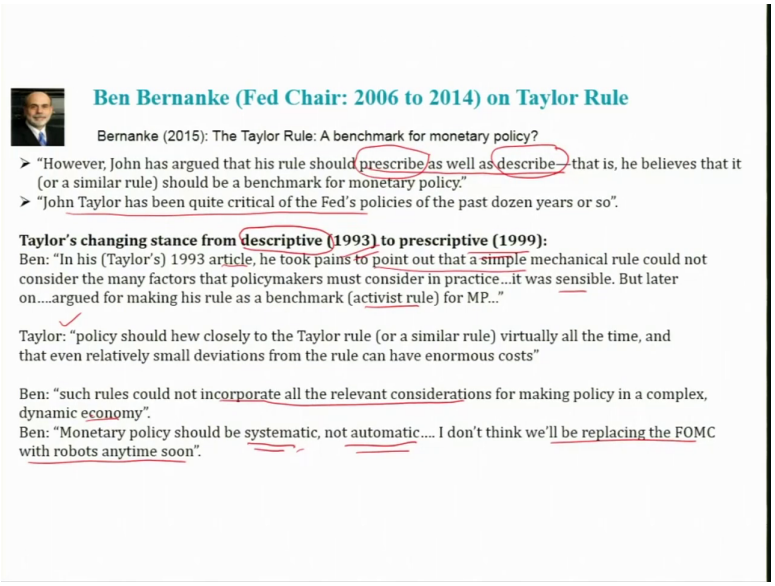

However, what Ben argue that John has argued that his rule should be prescribed as well as described, that is he believes that it should be a benchmark for monetary policy. That, Ben object to this because originally John Taylor proposed it as a descriptive tool, but later John Taylor argued that it should be a prescriptive tool, later on John Taylor asked for making it as a prescriptive tool.

So, according to Ben, John Taylor has been quite critical of Fed policies of the past dozen years or so. So, he also states that Taylor's changing stance from descriptive to prescriptive. So, in 1993 when the original article of John Taylor was published, it was mostly a descriptive tool. It was very helpful to understand the complex nature of monetary policy by this tool. It made things much easier.

However, later, John Taylor according to Ben, he began to make this tool not only just a descriptive, also as prescriptive tool. That means, arguing that Fed should follow this rule while setting Fed Fund Rate, while formulating monetary policy.

According to Ben, John Taylor in his 1993 article took pains to point out that a simple mechanical rule that policy makers must consider in practice. So, it was sensible. But later, argued for making his rule as a benchmark or make it as an activist rule for monetary policy.

So, what Taylor argued that "Policy should hew closely to the Taylor rule or a similar rule virtually all the time, and that even relatively small deviation from the rule can have enormous cost." This is what Taylor's argument, Taylor was suggesting.

But Ben is saying, "Such rules could not incorporate all the relevant considerations for making policy in a complex, dynamic economy". As the economy is very complex and is very dynamic as well, and according to Ben just following that making relying on one rule, that means, the Taylor's rule, making it as an activist rule, it cannot, it could not incorporate all the relevant considerations.

So, monetary policy should be systematic according to Ben, that means, based on all available information, and it should be more dynamic. Not automatic, not programmed of just following the Taylor's rule, instead it should be more systematic.

So, his argument is that "I do not think we will be replacing FOMC with the robots anytime soon", that means, his point is that is not were true, it is not ideal to follow any, just a formula for implementing the monetary policy.

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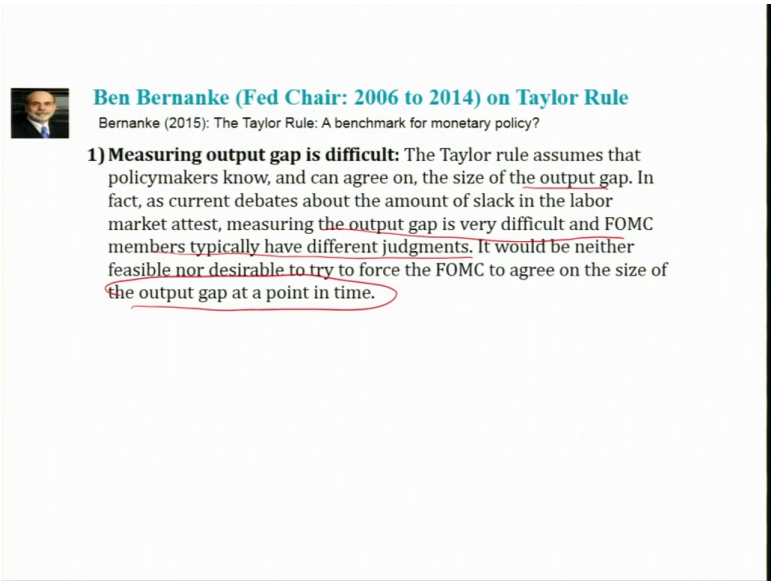

So, his various arguments against the Taylor rule are that one is measuring output gap is difficult because Taylor rule assumes that policy makers know and can agree on the size of the output gap. In fact, as current debates about the amount of slack in the labour market attest, measuring the output gap is very difficult and FOMC members typically have different judgments. So, it would be neither feasible nor desirable to try to force the FOMC to agree on the size of the output gap at a point in time.

So, importantly we have seen that the Taylor rule one of the key variables he takes into account is the output gap.

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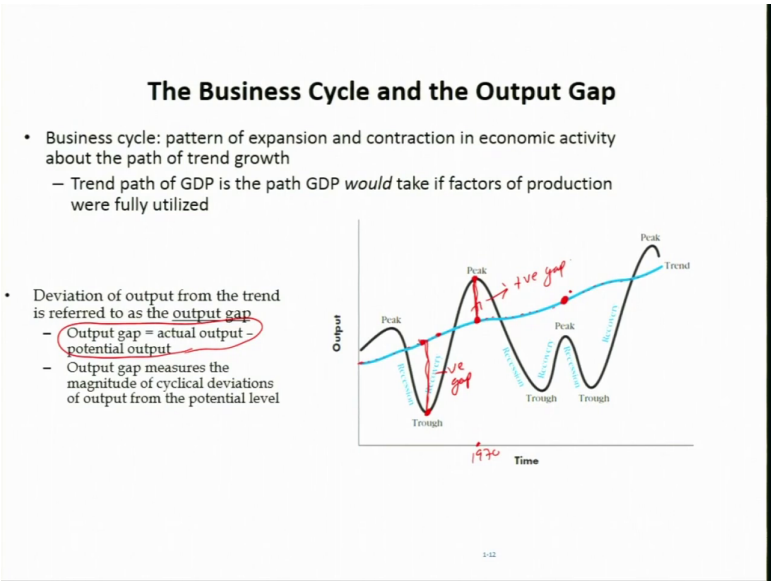

So, what is the output gap? This is the output gap. The so, that means, based on the output gap, this is a trend in fact, based on the actual output suppose this point of time, so this is the output. So, based on the past data, we will be making a linear forecast, a forecast, then this is going to be the natural output or potential output or potential GDP.

So, this is in the normal time if all the resources are utilized in the economy, then this is going to be the potential, natural output, right. So, this is you can see this is the trend in fact.

So, this is what we are talking about the potential gap between. For example, at a point of time, suppose this point of time in a particular year for example, take this for example, in 1970 just for example, so you can see that this is the peak. So, that the actual GDP is much greater than, actual GDP is greater than the trend that the potential GDP.

So, this gap we are going to say that this gap, this is the output gap, this gap is showing that economies at peak, that means, this is called boom, or the economy is at very hot. That means, there is peak, or the resources are working overtime, may be due to there is a huge demand from different sectors of the economy.

Then, as a result laborers are working overtime, factories are working more than the stipulated time. So, that means, the economy current GDP is greater than its potential GDP. So, this is the gap. In another instances, you can see here the actual GDP is this one, that

means, below the potential GDP. So, you can see that this is the negative gap, negative gap, here is a positive gap right.

So, this one, I just gave you the definition here, this is the output gap, that means, actual output minus potential output. So, here the question what Ben was raising, to measure the potential GDP at a particular point of time, suppose monetary policy is being designed at this point of time, this is in a particular date, so, at this point, how do we know this is the potential GDP.

Actual GDP, we can get, with that also will take some time, right. If the GDP for these 2 days, is you will be getting it after 1 month, 2 month or 3 months after a period. So, it will take time. Similarly, potential GDP also, this is not the correct estimate, this is a projection. Maybe after that, they will linearize it and there will be some delay. So, this measurement is problematic, something ironic as well. So, that Ben is arguing that is that variable has its own problems.

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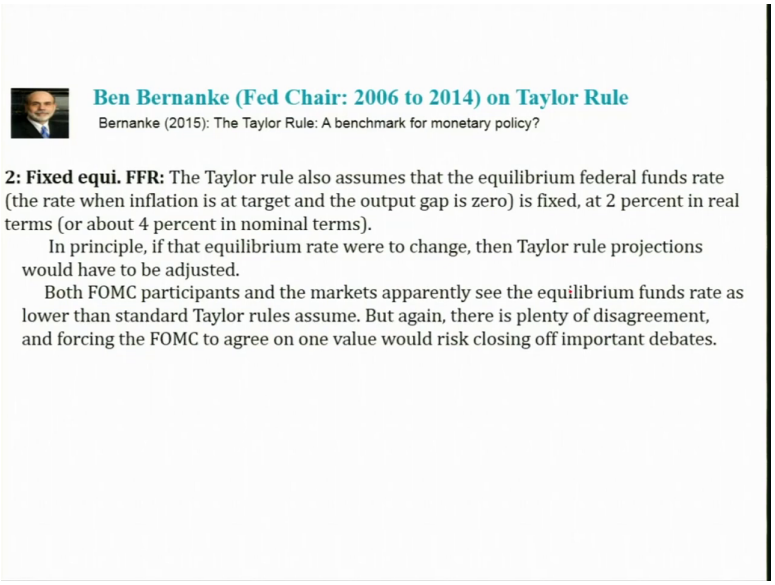

Then another thing is that fixed equilibrium Fed Fund Rate. The Taylor rule also assumes that equilibrium Fed Fund Rate is fixed at 2 percentage in real terms. So, in principle, if that equilibrium rate were to change, then Taylor rule projections would have to be adjusted.

So, both FOMC participants and market, apparently see the equilibrium funds rate as lower than standard Taylor rule assumes. So, but again, there is plenty of disagreement, and forcing the FOMC to agree on one value would risk closing of important debates.

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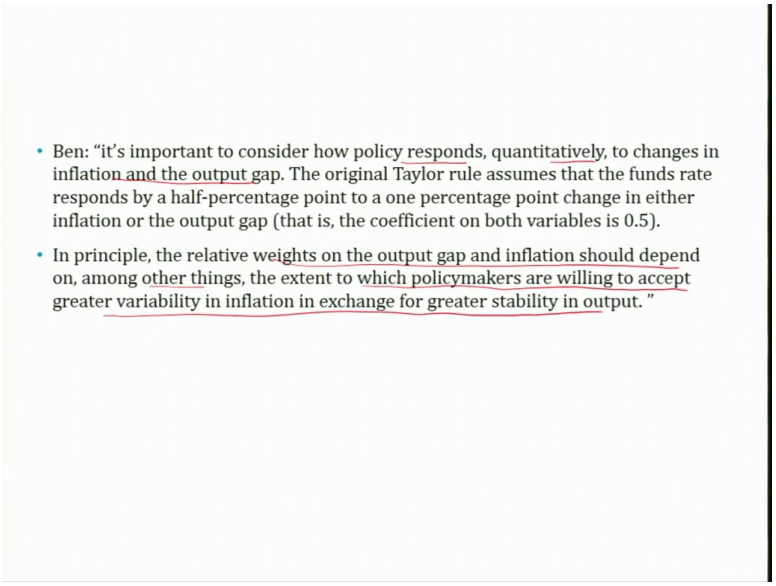

So, Ben, what he is saying that "It is important to consider how policy responds, quantitatively, to changes in inflation and output gap. The original Taylor rule assume that funds rate response by half-percentage point to one percentage point change in either inflation or output gap".

"In principle, the relative weights on the output gap and inflation should depend on, among other things, the extent to which policymakers are willing to accept greater variability in inflation in exchange for greater stability in output."

Because you know that there is a trade-off between inflation and output, it also depends on the policymaker's willingness to accept the trade-off, the variability in the trade-off. So, in that way, we cannot blindly simply follow the Taylor rule according to Ben.

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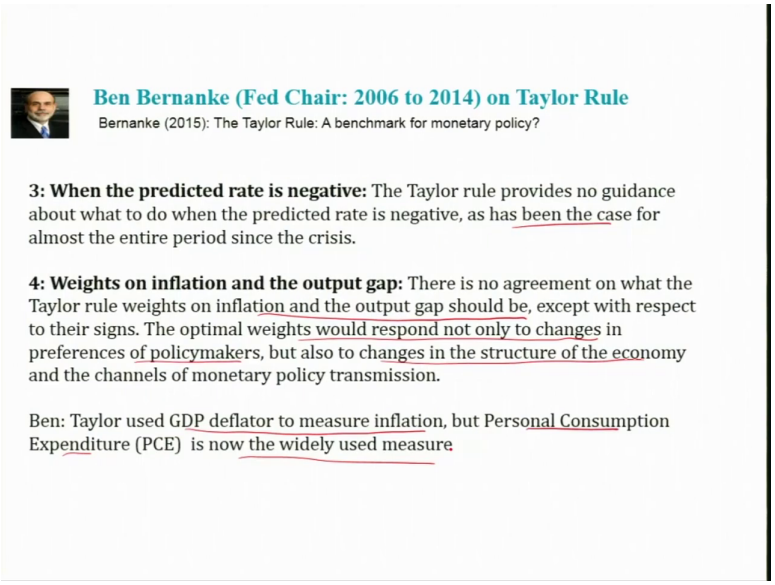

So, there are other considerations, that is third one is when the predictive rate is negative. When Taylor rule provides no guidance about what to do when the predictor rate is negative. Suppose by plugging all the value then when you get the Fed Fund Rate is negative. That means, when the Fed Fund Rate is negative means one bank is borrowing from the other, instead of paying interest, the borrowing bank will be getting interest from the lending bank. So, that also will not work in the real world.

So, here you know that this also you know clear guidance is given, also about the 0-bound problem. So, during crisis time, the Fed often reduce the Fed Fund Rate and even make it 0, 0 to 0.25, it was 2 years before and almost 1 year before Fed did it.

So, weights on inflation and the output gap, there is no agreement among the policy makers and other academicians on what the Taylor rule weights on inflation and output gap should be. So, the optimal weight would respond not only to changes in preference of policy makers, but also to change in the structure of the economy and the channels of policy transmission mechanism.

So, one more thing before I conclude this session, Taylor used GDP deflator to measure inflation, but these days personal consumption expenditure is now widely used measure to as a measure of inflation.

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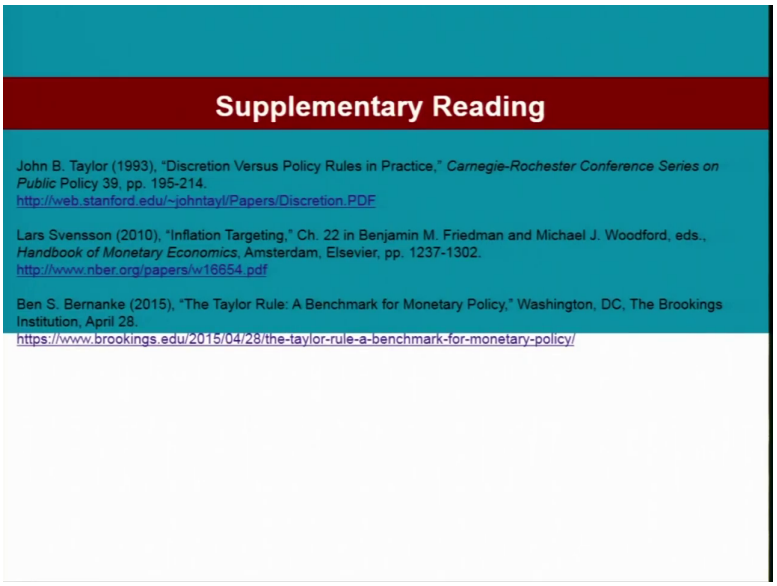

These are the reading materials for you to get more idea about what is Taylor rule and what are the argument against Taylor rule.

So, let me stop here. Thank you very much for watching this video.

Thank you.

Keywords: Taylor rule, fed fund rate, potential output, inflation gap, Fed chair, dovish, hawkish, Ben, prescriptive tool, descriptive tool