Lecture 5: Central Bank Mandates, a Streamlined Macro Model and a First Step at Forecasting

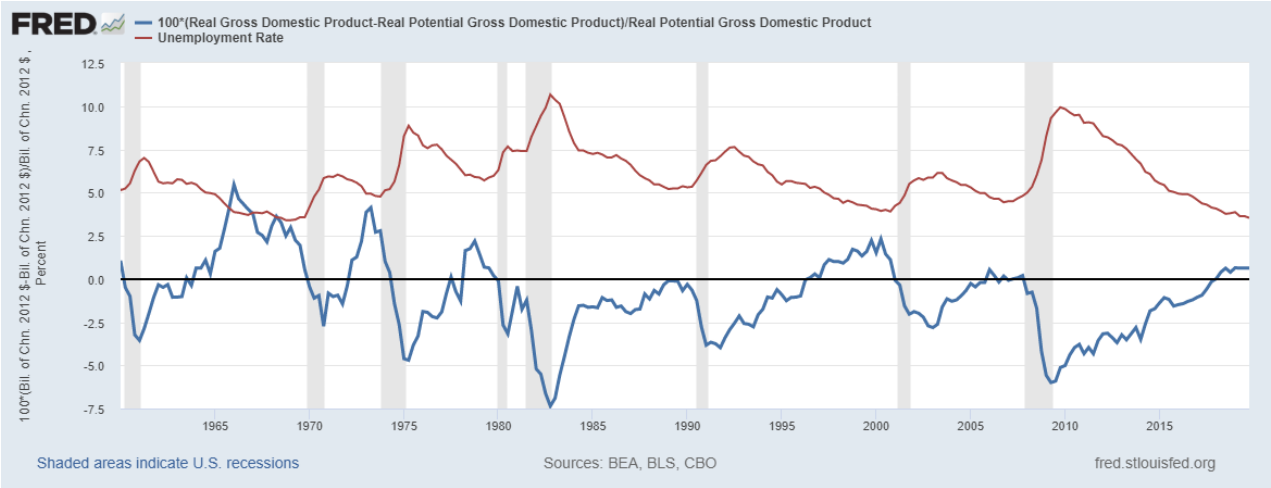
In the previous lecture, we learned two essential things about modern day economies. Growth is the goal and the rule. That said, economies exhibit persistent cyclical patterns. Armed with a sense of the long-term sustainable trajectory for an economy, and aware of its recent economic trajectory, we can conjecture about the future pace of economic growth. To do so, however, we need to cast one more player in this drama, the central bank.

The Federal Reserve Board

The U.S. FRB has a legally proscribed dual mandate. Provide the maximum long-term you can deliver, while keeping inflation low. The Fed's original purpose, assuring the safety and soundness of the U.S. banking system remains a focus. Recall that the Fed's original mandate was to protect the banking system — it was created in 1913 in response to an era of banking panics, 1873-1907. Obviously, attempting to keep banks safe can be labeled one aspect of keeping growth prospects good. As we will learn later in this course, the FRB was created in the image of the Bank of England, itself inspired by the insights of Walter Bagehot. For now, however, we will put lender-of-last-resort issues aside. Aside from bank issues, how does the Fed decide upon monetary policy?

Step 1: The central bank estimates potential real GDP and compare it to the actual level of real GDP. We looked at CBO's efforts to estimate potential GDP. How much output can the economy produce, given its labor force, its industrial capacity and its natural resources, without *overheating*. The simple theory? If the economy is running too hot, bottlenecks appear and wage and price pressures being to accelerate. We can compare actual output flow to this estimate of output potential, and derive an output gap. Below is a chart depicting the output gap, as estimated by the Congressional Budget Office (CBO). The chart also depicts the U3 unemployment rate.

(Notice that this evaluation looks at output and unemployment *levels,* not growth rates. Is the contemporaneous rate of output below near or above its potential, at appoint in time.)

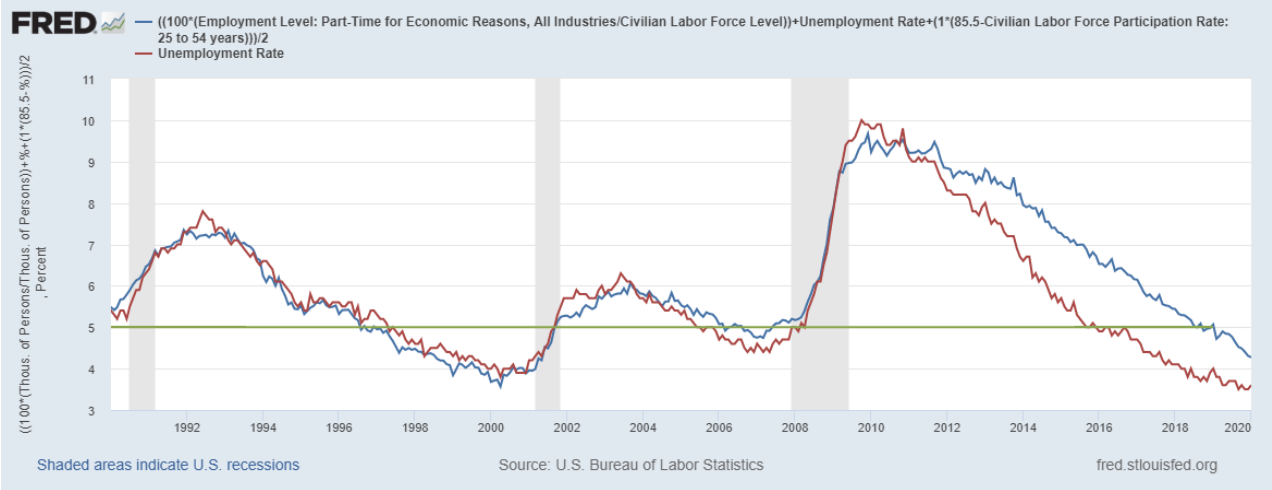


In both the late 1960s, and the late 1990s, real GDP (output flow), is estimated to have been running well above potential. In both cases, this occurred as the jobless rate fell from 5% to 3.5%. What about the mid and late 1970s. Two bouts of wild increases for the price of oil spawned two surges for inflation. Those jumps for inflation, some argue, meant that the economy was operating well above potential, despite joblessness well above 5%. A simpler explanation ties the inflation jump to oil spikes, not capacity constraints.

For the central bank, we can conclude that the goal is to keep the economy growing at rates that approach but do not greatly exceed the economy's potential growth rate.
As a practical matter, most forecasters use the unemployment rate and a NAIRU concept, to calculate where real the economy is relative to potential. Recall that NAIRU identifies a level for unemployment below which inflationary pressures rise. De facto, therefore, we need to agree upon an estimate for NAIRU, and then we judge the economy to be at, above, or below potential.

Can we conclude that NAIRU is 5%, simply by looking at the 1960s and late 1990s experience? No. the U3 jobless rate is a summary measure of the jobs backdrop. It does not however measure underemployment—those accepting part-time jobs, because they cannot find full time work. Nor is it sensitive to those who have given up looking for work—those who would label themselves jobless, but looking for work, if they thought the search was useful.

Let us create an expanded definition of labor market slack, 'L'. It will reflect those who identify as unemployed, those who are prime age and out of the labor force, and those who hold part-time jobs, but wished they had full time jobs. The chart below compares L with U3, from 1994 through January of 2020. Note that from 1986 through 2009 deviations are quite small. The yawning wedge that appears, post the Great Recession, suggests that labor market slack, early 2016, is considerable higher than the level suggested by the 5% level for U-3.



What does this chart reveal? In previous circumstances when L was around 5%, the U3 unemployment rate was a bit below 5%. When U3 touched 5%, in early 2016, L was 6.8%. In early 1993, with L at 6.8%, U3 was at 6.7%, well above anyone's notion of NAIRU.

Where is L, as of early 2020? The January reading is 4.3%, only 0.7 percentage points above the January reading of 3.6%. Thus, the latest L reading suggests that even an expanded measure of labor market slack suggests we are near to NAIRU.

Step 2: The Fed cares about the level of activity relative to potential *and* the growth rate relative to a measure of long run sustainable growth. We need an estimate for the long-term growth rate for the labor force and for labor productivity gains.

> Lecture 4 concludes that we pencil in 1.5%'/yr. for %Δ **of** labor productivity
> Lecture 3 observes that 0.5% pop, minus aging = 0.3/yr. for labor force.

At present we think LTSG=1.8%/yr.

Step 3: The Fed Sets a Target Zone for Inflation. If inflation is above this zone the FRB tightens, to slow the economy raise unemployment and lower inflation. Conversely, if inflation falls below the zone, the Fed eases in order to stimulate activity. The Fed, at present, identifies 2% as the ideal inflation rate.

.

FRB Policy and the Taylor Rule:

What constitutes 'easy', 'neutral' or 'tight' monetary policy? In normal times, that is to say, the lion's share of our experiences from 1950 through 2005, the primary focus was on the FRB determined level of the federal funds rate. In simplest terms Fed monetary policy has amounted to the FRB buying and selling t-bills, in order to peg the level of the fed funds rate—the rate that banks charge one another for short term funds. Over the period 1993-2005, the Taylor rule was embraced as a handy tool for exploring the issues that drove fed funds rate targeting decisions. John Taylor, in 1993, provided us with a simple equation meant to allow for thinking systematically about inflation and unemployment. The Taylor equation:

$f = \pi + \alpha(\pi-\pi^*) + \beta\cdot(U^*-U) + r^*$

Where:

f = fed funds rate
π = inflation rate
π^* = the Fed's inflation target
U*-U = deviation of unemployment from full employment
r* = neutral real short rate.
α and β are parameters, econometrically determined.

(Note: Inflation appears twice in the equation because the Fed is trying to set real rates. They need to change rates, over and above any changes in the inflation rate.)

The Taylor rule, stated above, attempts to characterize Fed policy a function of two inputs—the unemployment rate and the inflation rate. The logic of the Taylor rule is simple:

The FRB uses open market operations to set the real fed funds rate.
If inflation and unemployment are ideal, the Fed puts the real rate in *neutral*.
If inflation is high and unemployment low the Fed targets a *restrictive* real rate.
If unemployment is high with low inflation the FRB sets an *easy* real funds rate.

Let's posit the following:
The Fed's target inflation rate is 2%.
The Fed's target unemployment rate is 3.5% for U3 and 4.3% for L

As originally estimated, the neutral real short rate was 2%
α =0.5 and β=1
The Taylor Rule would then read:

$$f = \pi + 0.5\cdot(\pi-2) + 1\cdot(3.6\%-U) + 2$$

If we are in equilibrium, inflation is at 2%, unemployment is at 3.6%. In that case the equation says the fed funds target rate equals the inflation rate plus the neutral real short rate, in this case 2%+2%=4%.
If the economy is overheating, with the unemployment rate at 3% and inflation at 3%, the Taylor rule requires the Fed to set a high fed funds rate:

$$f = 3 + 0.5\cdot(3-2) + 1\cdot(3.5\%-3\%) +2 = 6\%$$

The Taylor Rule: Two Big Modifications

How has the Taylor Rule done as a forecaster of the Fed? As the next charts make clear, the Taylor Rule had a tough ten years from 1997 to 2007, even before we experienced the Great Recession. Part of the problem reflected the wild swing for energy prices. Oil prices fell to below $10 per barrel, in mid-1998, and climbed to more than 15 times that price in mid-2008. That put CPI changes into very volatile territory. Taylor Rule calculations, as chart 1 shows (below), called for volatile swings for fed funds despite relative quiescence for underlying price pressures.

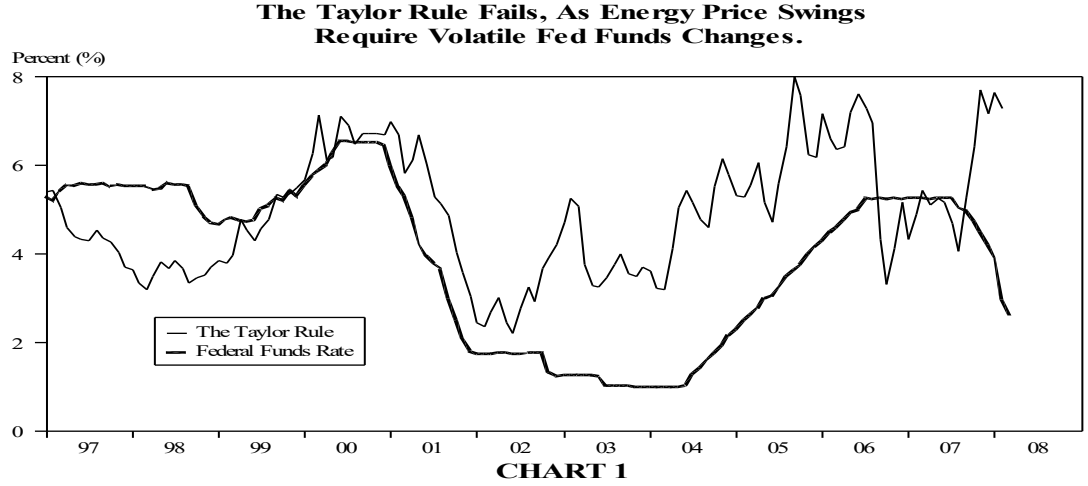


CHART 1

Fed policy makers, in response, elevated the importance of core inflation. We therefore need to revise our calculation of the Taylor rule, using a core measure of inflation. But as chart 2 reveals, a Taylor Rule fed funds trajectory using a core measure (the core CPI) also does a poor job of catching actual swings in the overnight rate. In particular a core CPI generated Taylor Rule fails to anticipate late 1990s tightening. It fails to predict aggressive Fed ease in 2001-2002. And quite spectacularly, both the core CPI Taylor Rule and a Taylor Rule using headline CPI failed to anticipate the violent Fed ease of 2008.

The neutral real short rate, r*, a variable, not a parameter.

The second modification to the original Taylor equation? We recognize that r*, the real short term interest rate that neither speeds up growth, nor slows it down, changes over time. In 1999, amid wild enthusiasm about growth opportunities, r* looked close to 3%. In the tepid expansion backdrop that has persisted following the Great Recession, it now appears that r* is closer to ZERO.

We now recognize that when we use the Taylor equation, we are forced to make several judgements:

1. What is U*
2. What is r*

Federal Reserve Board Chair Jerome Powell spelled this out in a 2018 speech: https://www.federalreserve.gov/newsevents/speech/powell20190823a.htm

The FRB and the Zero Bound

What does the Taylor rule tell us about Fed policy in a very weak economy? Suppose the economy is in a deep recession, with the unemployment rate at 9.5% and inflation at 1%. Recent experience suggests that in such circumstances the neutral real short rate, r*, will be quite low—we currently think it is around 0%. The Taylor equation tells us, given these judgments about key inputs, that the Fed should deliver a strikingly low fed funds rate:

f= 1 + 0.5(1-2) + 1(3.5-9.5) + 0 = -4.5%

More to the point, in the world that followed the onset of the *Great Recession* a Taylor Rule calculation directed the Fed to target fed funds well BELOW ZERO.

What does that mean? It says that if you put $100 in an interest bearing checking account, one-year later you will have $95.50—you will have lost $4.50. That is both hard to do, and many argue, not a very bad idea. And therein *lay* the justification for various QE2 bond buying efforts by the Fed and for their decision to explicitly specify their intentions concerning when short rates will rise. We will formally explore the dynamic real economy/financial market linkages that justify these actions in the second half of the semester when we introduce the full panoply of financial instruments into our model. For now, we simply need to recognize that 'the zero bound' for the nominal fed funds rate is, very much, a real world problem, in the aftermath of the *Great Recession*.

The ECB: A Charter That Dictates a Singular Focus, Inflation

Unlike the FRB, the ECB defines their mandate singularly. They conduct monetary policy solely to ensure price stability, which they target as 1.5% to 2% headline inflation. Low inflation amid high unemployment, for the ECB, warrants no dramatic response. They argue that price stability is the only purview of the central bank.

In addition, and amazingly, in light of the history that surrounds the development of central banks in modern day economies, the ECB professes to have no lender of last resort responsibilities. As the previous head of the European central bank liked to say, "the ECB has only one needle in its compass, and that is inflation". Again, this striking difference between the ECB and its sister central banks—the FRB, the BoE, the BoJ—created enormous policy challenges, under the direction of Jean Claude Trichet. Mario Draghi, a much more creative central banker, has end run a good many of these seeming impediments. We will address these in the second half of the semester.

If we, again, ignore bank safety issues, it appears to me that the 'one needle in the compass' approach to monetary policy, instead of a dual mandate, has proven to be a painfully sub-optimal approach to conducting policy. We can look upon the *Great Recession* as a natural experiment, set to test the idea that one focus is all central bank's need to get policy right. Some academics, champion the ECB mandate asserting that price signals are all a central bank needs to focus upon, in order to deliver optimal monetary policy strategy.

This line of reasoning is labeled *the divine coincidence.* The argument depends upon the notion that inflationary pressures will recede if excess capacity is available in the system, ultimately causing prices to fall. Thus the central bank that exclusively focuses on prices will be easing aggressively amid high joblessness and excess capacity, just as they should be, notwithstanding the fact that they are solely looking at price statistics. How so? Standard theory asserts that excess capacity will force inflation below the target level, justifying ease on price stability grounds. In other words, whether you focus on inflation and unemployment, or just inflation, you will end up doing the same thing, as weak growth will deliver the faltering price pressures that justify ease.

The ECB and the Crisis

Jean Claude Trichet was the ECB President from 2003 to 2011. He steadfastly embraced the singular ECB price stability goal.

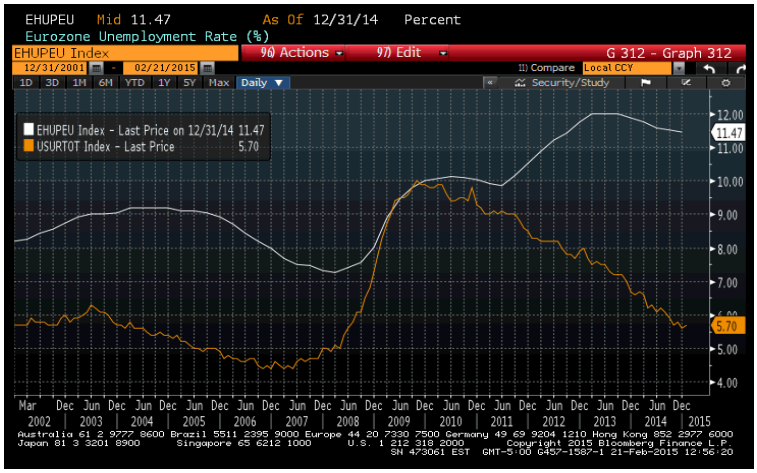
This framework was always flawed. As we discuss in the pages that follow, wage and price stickiness, amid BIG Recessions, will lead a one target central bank to remain too tight. Moreover, in a financial crisis such myopia can, indeed *did*, lead to disastrous results.

In the table below we provide a look at the ECB'S target rate—their key interest rate. They expect that the target rate will greatly influence *eonia*, the rate that European banks charge one another for funds. How have the two rates fared, since the onset of the crisis, and how has Europe fared relative to the USA? Consider the two tables below:

	Jun-07	Dec-07	Jul-08	Jun-09	
ECB MAIN REFINANCING RATE	4.00	4.00	4.25	1.00	
FEDERAL FUNDS TARGET RATE	5.25	4.25	2.00	0.25	
	Dec-10	Jul-11	Dec-11	Dec-12	Dec-14
ECB MAIN REFINANCING RATE	1.00	1.50	1.00	0.75	0.05
ECB QE	NO	NO	NO	NO	YES
FEDERAL FUNDS TARGET RATE	0.25	0.25	0.25	0.25	0.25
FRB QE	YES	YES	YES	YES	NO

We discover several things. When the Great Recession took hold, in 2008, the U.S. Fed was easing aggressively. The ECB, slavishly focused upon inflation, actually raised their target rate in July of 2008. We also see that the U.S. FRB much more aggressively eased, hitting the ZERO BOUND in mid-2009. In 2010, and again in 2012-2013, resorted to QE, to supplement their easy money policy.

The Trichet led ECB, in stark contrast, stopped easing in mid-2009, when their overnight rate touched 1%. They tightened in 2011, reacting to a temporary rise for inflation, and ignoring very high joblessness. Obviously there are major differences between the U.S. and Europe. Nonetheless, some of the major gains in the U.S., relative to Europe, in the aftermath of the Great Recession, can be laid at the doorstep of the more aggressive ease delivered by the Fed.
Read the following: http://www.levyinstitute.org/pubs/wp_742.pdf



More Generally: The Central Banker Reaction Function

Central Bankers and the 3-Equation Model

We now have the pieces in place to think about a barebones macroeconomic model. In this section we will be using the model depicted in the Carlin-Soskice paper(C-S). We assert the following.

The IS Curve

The elemental notion that drives central bankers, business planners and speculators is that output is affected by the level of real interest rates. A big jump for real interest rates, other things equal, will reduce investment and in turn the overall level of output and income. C-S puts it this way:

$y_1 = A - ar_0$

(real income is a positive function of autonomous expenditure A and a negative function of the real interest rate r)

The Phillips Curve

We learned about the relationship between price pressures and the level of resource utilization in the last lecture. The most familiar, the Phillips Curve, relates changes in the rate of inflation to deviations from equilibrium levels of output. Changes in inflation are driven by the output gap. Carlin Soskice state:

$$\pi_1 = \pi_0 + \alpha (y_1 - y_e)$$

where π is the rate of inflation and y_e is equilibrium output.

We can also think of deviations of unemployment, U, from NAIRU, as a Phillips Curve measure, as we did in the last lecture:

$$\pi_1 = \pi_0 + \alpha (U^* - U)$$

Note that in both cases we start with a contemporaneous inflation rate, π_0 and the output gap deviation shifts the inflation rate up or down. This is an all important modification of the original notion of an unemployment/inflation tradeoff. We don't get to have unemployment permanently below NAIRU for a one-time increase for inflation. Instead each year that we operate above output potential, we add to our inflation problem. This *accelerationist* Phillips Curve model makes it clear that we cannot benefit, in the long run, from keeping the economy 'too hot'.

The Monetary Policy Rule

The final equation in our three equation model is the monetary policy rule. A Taylor Rule is a good starting point.

$$\text{fed funds:} \quad f = \pi + \alpha(\pi - \pi^*) + \beta(U^* - U) + r^*$$

Manipulating the Barebones Macro Model

We are now ready to think about forecasting. We have a three equation model that relates investment and therefore output to interest rates, inflation as a function of output relative to potential, and interest rates, a function of inflation and output relative to central bank target.

We can add to this model a painful truth about economic forecasting. The starting point, when thinking about the pace of economic growth, is unfortunately, backward looking. Absent any policy changes or exogenous shocks, the best guess about the next six months real growth rate, is what the trajectory was over the past 6 months.

So our forecasting framework now takes shape.

We posit a long-term sustainable growth rate, in today's circumstances in the USA, 1.8%.
We posit a NAIRU, in today's circumstances in the USA for U3, 3.5%.
We identify the Fed's target for inflation, 2%.
We calculate the economy's real growth trajectory over the recent past:

Real GDP	Annualized	Growth
Last	Last	Last
Two Qtrs.	Year	Two Yrs.
2.1%	2.3%	2.4%

Our preliminary assumption is that, absent policy efforts, exogenous shocks, or cyclical turning point dynamics, the next six months growth rate approximates the last six months pace.

We then ask ourselves the following question:

1. Do we want to modify our assumption about real growth, a consequence of an exogenous shock? If no, assume %Δ Y will continue its recent pattern, if yes, modify the recent trajectory, imposing the effects of the shock, with no compensating policy action.

2. Given your forecast for %ΔY, answered in question 1, what pace do you expect for jobs growth?

3. Combine your expectation for jobs growth, with forecasts for growth in the population, and for labor force participation, by age cohort. Use this to forecast a value for the U3 unemployment rate.

4. Use your forecast for U3 to make a judgement about economy's output gap over the period (the projected jobless rate versus our estimate for NAIRU).

5. In turn, using a Phillip's curve calculation, what should we expect from inflation?

6. Finally, in light of your expectations for Y, U and π, calculate what the Fed might do, using at Taylor equation.

7. Does your expectation for Fed policy lead you to modify your expectations for Y, given your sense of the IS curve? If so you can iterate.