Econ 352 - Inflation: Phillips Curves and Neo-Fisherism

(See Williamson Ch. 15)

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A Warning

- A warning: there is a school of thought that takes the New Keynesian model and thinks about its implications seriously
- Stephen Williamson, the author of our textbook, is one such person!
- There is a "curious" or even "heterodox" conclusion that comes from this orthodox model, which some brand "Fisherian" or "Neo-Fisherian"
- Raising interest rates may *increase, not decrease* inflation
- Williamson is an outlier, but with good company–I'm more agnostic, but the Fisher relation keeps me up at night

Inflation

- Inflation is important!
  - Hyperinflation is devastating to real production
  - Even moderate amounts of inflation cost "shoe-leather"
  - Inflation uncertainty affects credit market uncertainty
  - Unexpected inflation has distributional effects
  - In a model with sticky prices, there can be employment/real effects
- So we'll first go through the standard model, then the Neo-Fisherian one

Phillips Curve

- We claim that there is a "Phillips curve," a relation between inflation and output (or unemployment)
- If inflation from period 0 to 1 is higher than firms expected in period 0, then their prices are artificially low
- Households will demand more (and firms will produce it, even though prices suboptimally (to them) low, because still making a profit (monopsonistic competition))
- We write this as:

$$i = a(Y - Y_m) + bi'$$

- Where i is the inflation rate, Y is GDP, Y_m is the "efficient" level of GDP, $a > 0$, and $0 < b < 1$.
- Idea: the higher inflation, the smaller the "output gap"
- Also: higher future inflation, the higher current inflation, as firms that can change prices in anticipation

Fisher Relation

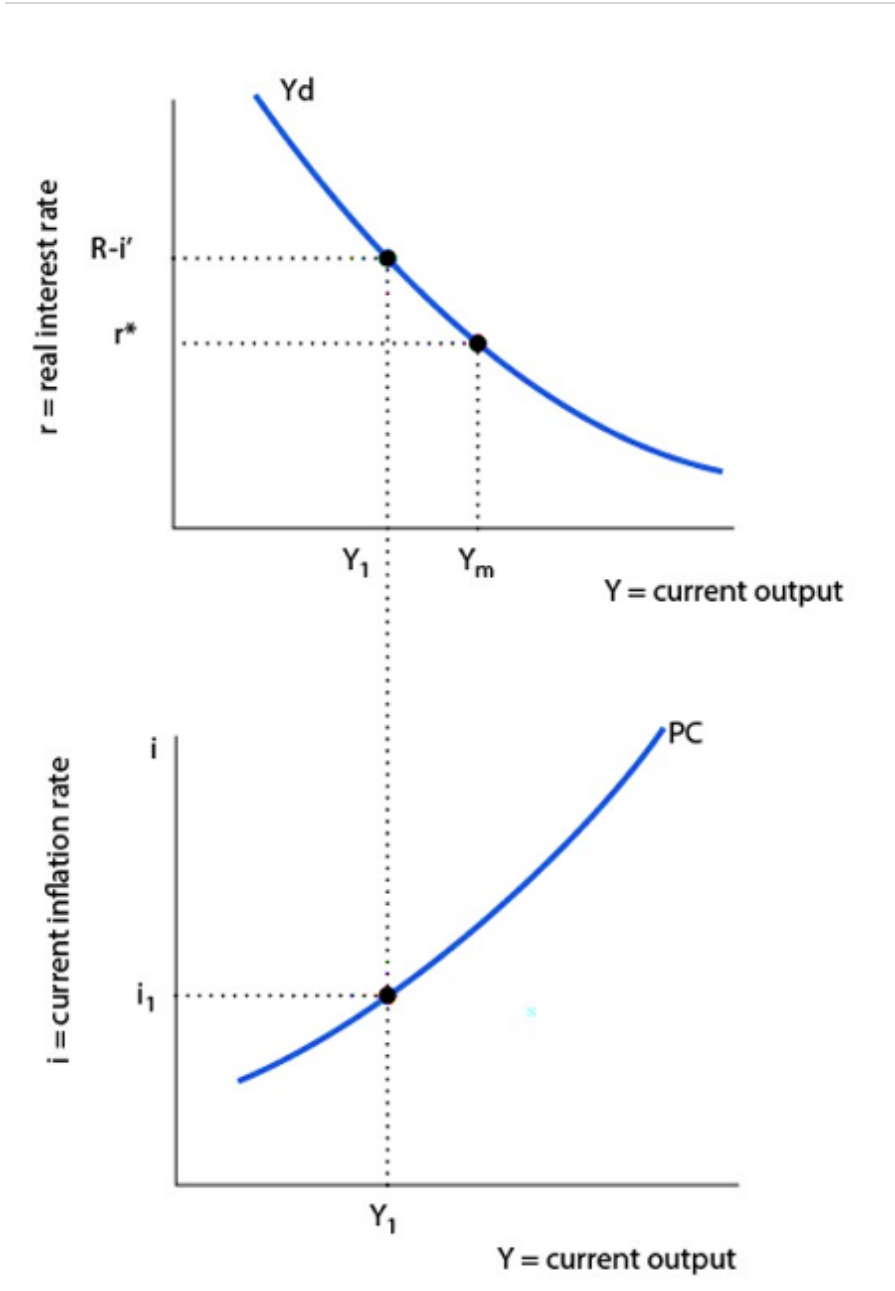
- Fisher relation: the real interest rate is the nominal interest rate minus anticipated future inflation:

$$r = R - i'$$

- We can use $i = a(Y - Y_m) + bi'$ and the Fisher relation in the NK model to determine inflation (assume i' fixed)

- Logic:
  1. R, the nominal interest rate, is set by the central bank
  2. i', inflation expectations, are exogenous/set
  3. $R - i'$ affects Y (the "output demand" curve or the "IS" curve
  4. Y determines i via $i = a(Y - Y_m) + bi'$
- Let's see it graphically

The Basic New Keynesian Model



Monetary Policy Goals

- The logic is that central bank controls R, which affects Y, which affects i
- How do we determine R? "optimal monetary policy"
- Federal Reserve: dual mandate of "price stability" and "maximum employment" (tradeoff between Y and i)
- If the real rate of interest r^* decreases, Y_m rises, then how should the bank respond?
  - Could decrease nominal interest rate so $Y' = Y'_m$, but then i would rise
  - Could do nothing, but then output gap (unemployment, for instance) would rise
  - If weights both, then do something in the middle
- Let's see it graphically

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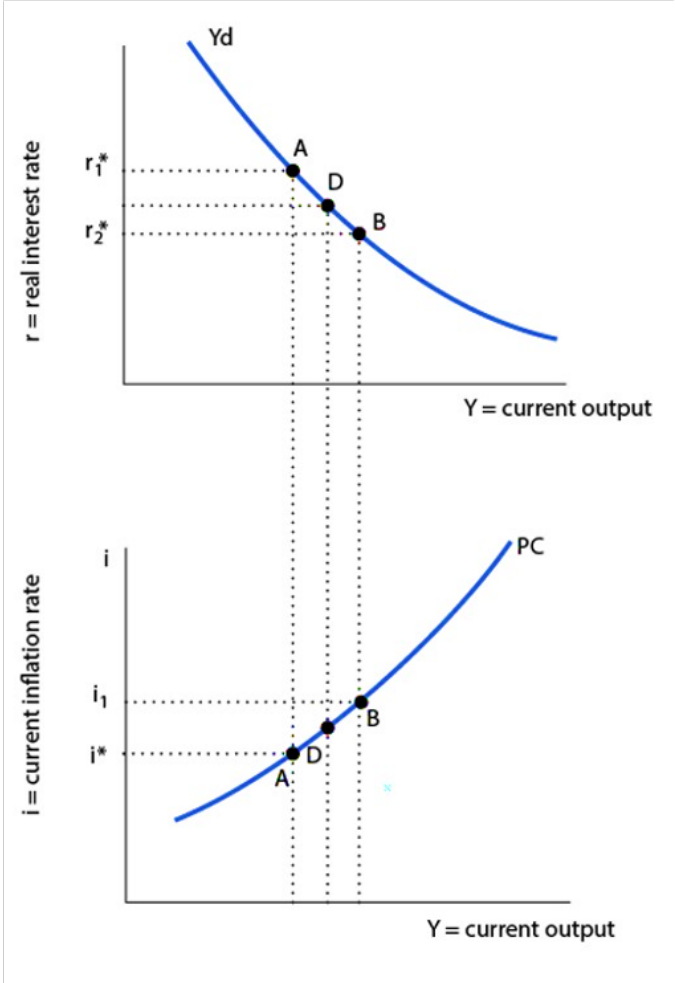

We start at A, but events shift us to B, and we split the difference and choose D, so output below potential but inflation lower than it would be

Increase in i'

- When i' shifts, the "intercept" of the Phillips curve increases
- Inflation is now higher than it would be
- Central bank has a few options
  - Could do nothing: $R + i'$ increases because i' increases, real interest rates increase, output falls, inflation falls
  - Could keep: $R + i'$ constant. Output doesn't change, but inflation high.
  - Could split the difference, and output falls a little and inflation rises a little.
- Let's see it graphically

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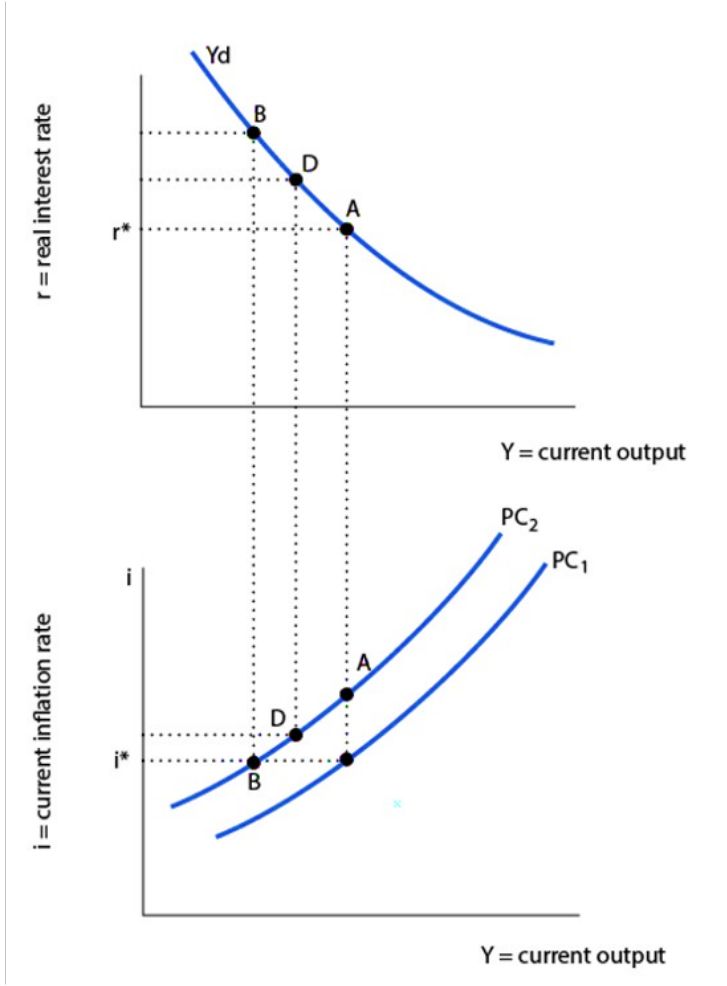

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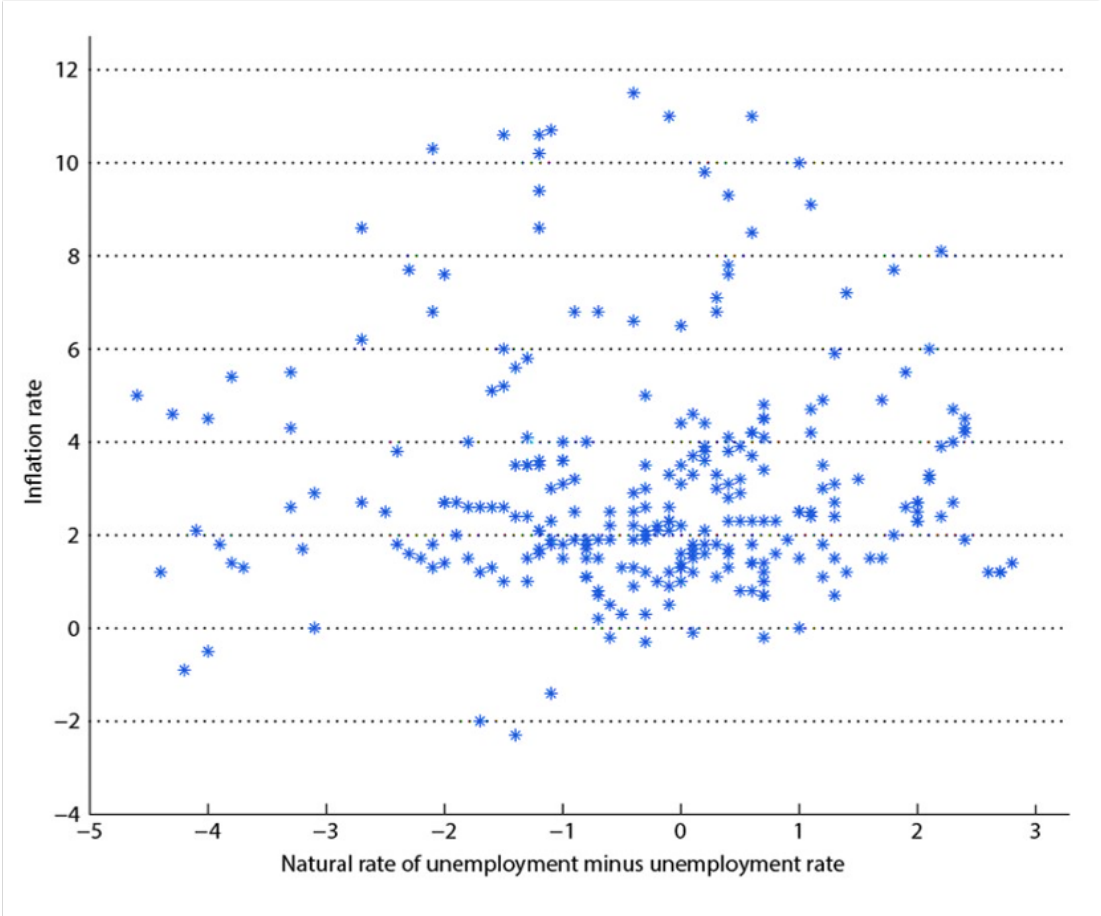
Phillips Curve in the Data



We assumed a relationship between i and Y^*, but it's not so clear that there is one

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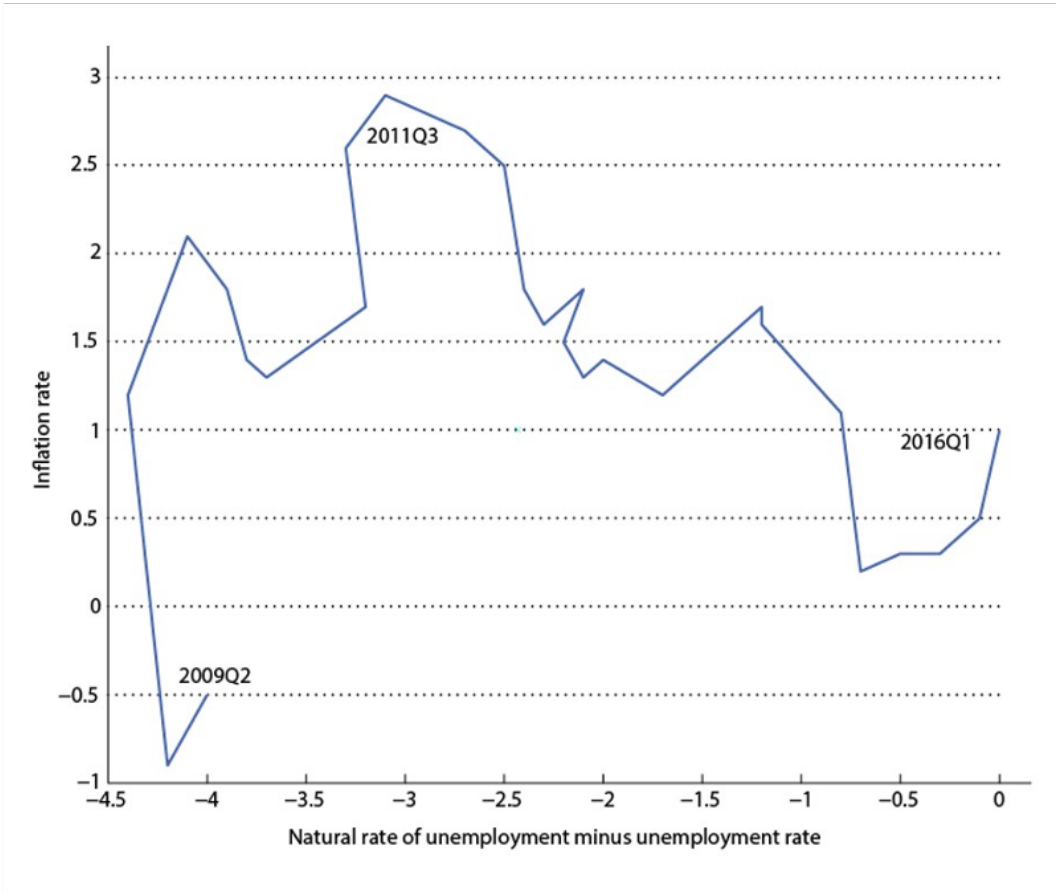

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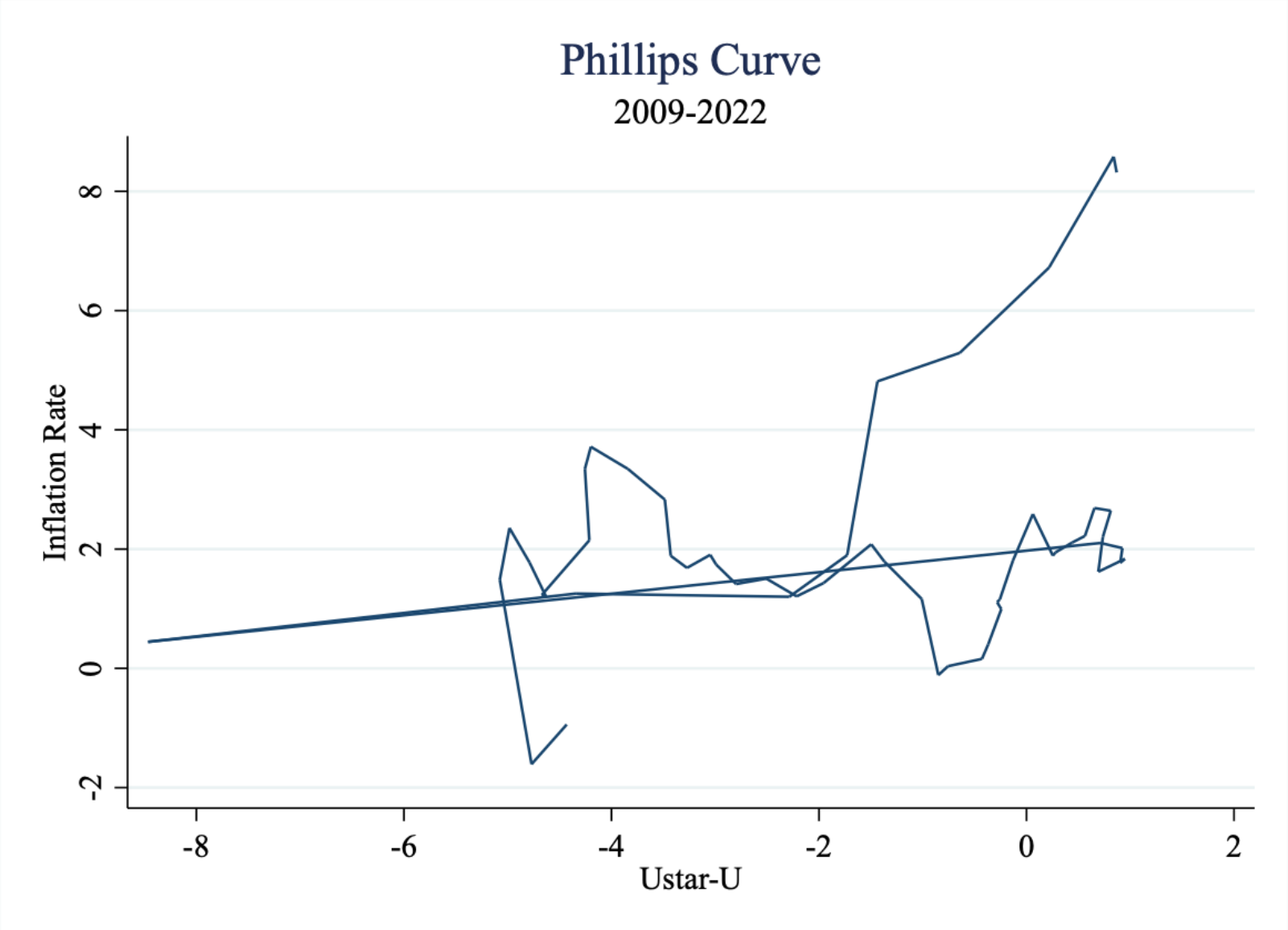
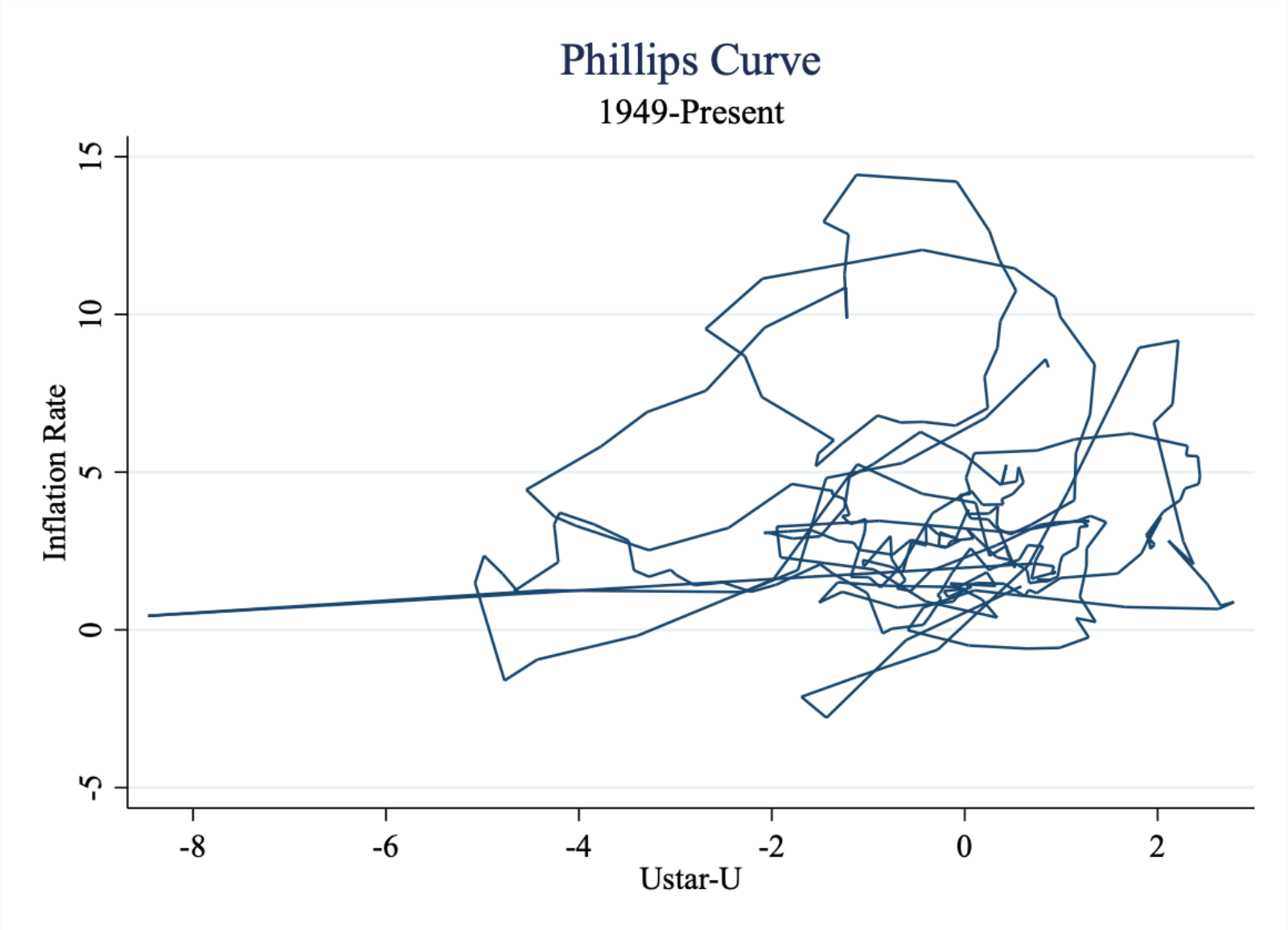


Relationship

Phillips Curve in the Data

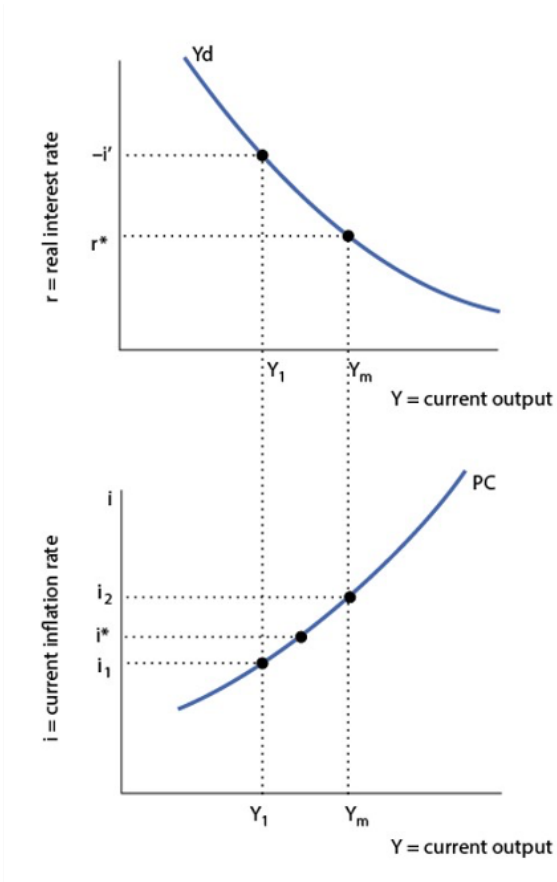


The long view

Low Real Interest Rates and the ZLB

- We now have real interest rates r distinct from nominal interest rates R
- It's been observed that global real interest rates have been falling secularly for some time
- When r is low, then it's hard for the bank to set low nominal interest rates (R=r+i)
- Can introduce a "liquidity trap" type situation
- When nominal rates are zero, $r = -i$

Liquidity Trap at the ZLB

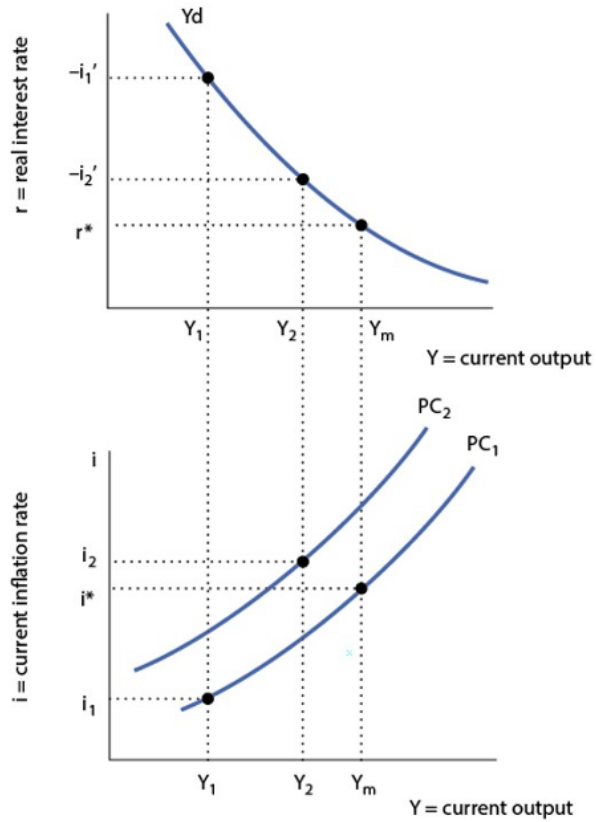


Now, we have "too low" inflation and an output gap (want R lower but can't!)

How can we solve?

- Issue: we want to lower R but can't, it's zero!
- One possibility: **forward guidance**
- Recall that: $i = a(Y - Y_m) + bi'$
- But of course, $i' = a(Y' - Y'_m) + bi''$ tomorrow
- So we can raise i (lower r) even further by promising higher inflation not only today but tomorrow too

Forward Guidance & Liquidity Trap at the ZLB



The boy who cried wolf

- We can lower r now by raising i, which we raise by raising i' in future
- But in future, it may not be in our interest to have higher inflation
- Commitment dilemma: central bank has to commit to do something that, if it works as intended, it won't want to do
- Same as studying: writing hard exams is hard, grading them is hard, but I want you to learn
- If I could tell you the final exam is hard, then you study, learn the material, and everyone better off if I don't write hard exam
- But, knowing that, you shouldn't study hard
- Having an institution that values its credibility allows you to avoid this problem (just like being a trustworthy person

Reputation (Tom Sargent)

> *In the future, you too will respond to incentives. That is why there are some promises that you'd like to make but can't. No one will believe those promises because they know that later it will not be in your interest to deliver. The lesson here is this: before you make a promise, think about whether you will want to keep it if and when your circumstances change. This is how you earn a reputation.*

Q: can you ever promise to do something it isn't in your interest to do? (No, if you include future reputation!)

Forward Guidance in Practice-Dec. 2008

The Federal Reserve will employ all available tools to promote the resumption of sustainable economic growth and to preserve price stability. In particular, the Committee anticipates that weak economic conditions are likely to warrant exceptionally low levels of the federal funds rate for some time.

Forward Guidance in Practice-Dec. 2012

. . . the Committee decided to keep the target range for the federal funds rate at 0 to 1/4 percent and currently anticipates that this exceptionally low range for the federal funds rate will be appropriate at least as long as the unemployment rate remains above 6-1/2 percent, inflation between one and two years ahead is projected to be no more than a half percentage point above the Committee's 2 percent longer-run goal, and longer-term inflation expectations continue to be well anchored. The Committee views these thresholds as consistent with its earlier date-based guidance. In determining how long to maintain a highly accommodative stance of monetary policy, the Committee will also consider other information, including additional measures of labor market conditions, indicators of inflation pressures and inflation expectations, and readings on financial developments. When the Committee decides to begin to remove policy accommodation, it will take a balanced approach consistent with its longer-run goals of maximum employment and inflation of 2 percent.

Forward Guidance in Practice-Mar. 2014

To support continued progress toward maximum employment and price stability, the Committee today reaffirmed its view that a highly accommodative stance of monetary policy remains appropriate. In determining how long to maintain the current 0 to 1/4 percent target range for the federal funds rate, the Committee will assess progress—both realized and expected—toward its objectives of maximum employment and 2 percent inflation. This assessment will take into account a wide range of information, including measures of labor market conditions, indicators of inflation pressures and inflation expectations, and readings on financial developments. The Committee continues to anticipate, based on its assessment of these factors, that it likely will be appropriate to maintain the current target range for the federal funds rate for a considerable time after the asset purchase program ends, especially if projected inflation continues to run below the Committee's 2 percent longer-run goal, and provided that longer-term inflation expectations remain well anchored.

Forward Guidance in Practice

- Fed kept its options open
- Forward Guidance wasn't super clear
- But perhaps that's all they could do–only make promises not only that you intend to keep, but that future you will want to keep

Neo-Fisherism

- Neo-Fisherians think we have the model all wrong
- Disclaimer: their model makes more sense to me, but I struggle with empirical evidence!
- Claim: we should *lower* interest rates to fight inflation, rather than raise them as NK says
- Why? What's the model?

Output Demand

- Let Y be demand for goods today, Y' be demand tomorrow, $1/d$ be how their relationship changes as a function of the real interest rate $R - i'$ and the natural real interest rate r^*

$$Y - Y' = -\frac{1}{d}(R - i' - r^*)$$

- Basic idea is that tradeoff between demand today and demand tomorrow is governed by interest rates and impatience (the natural real interest rate)

- An equation like this, the "Euler Equation" pops up in intertemporal macro all the time

Aside: Euler Equation

- For instance, consider a consumer's problem, where β is the discount factor (impatience):

$$u(c, c') = \frac{c^{1-\sigma}}{1-\sigma} + \beta \frac{(c')^{1-\sigma}}{1-\sigma}$$

$$s.t. c + \frac{c'}{1+r} = y + \frac{y'}{1+r}$$

- Taking first order conditions in a Lagrangian framework, we get:

$$c^{-\sigma} = \lambda$$

$$\beta(c')^{-\sigma} = \frac{\lambda}{1+r}$$

- Or, combining the two:

$$\left(\frac{c}{c'}\right)^{-\sigma} = \beta(1+r)$$

- Taking logs:

$$\log(c) - \log(c') = -\frac{1}{\sigma}\left(r + \log(\beta)\right)$$

- Which looks like what Williamson wrote down ($log(\beta) \approx -r^*$ in models):

$$Y - Y' = -\frac{1}{d}(R - i' - r^*)$$

Output Demand/Euler Equation

- What does the (new, sensible) Euler Equation say?

$$Y - Y' = -\frac{1}{d}(R - i' - r^*)$$

- People like so smooth (governed by d)

- Consumption tomorrow relative to today rises more as patience (β) rises (or for Williamson, r^* falls)

- Consumption tomorrow relative to today rises more as the real interest rate $R - i'$ rises

Simpler Phillips Curve & Rational Expectations

- We simplify the Phillips curve to say that inflation is positively related to the output gap (we ignore future inflation, because it won't actually qualitatively affect our results, but makes math harder)

$$i = a(Y - Y_m)$$

- If Y_m isn't changing, and r^* is also exogenous, we have:

$$i' = a(Y' - Y_m)$$

- Subsituting in for Y and Y', we get:

$$i' = \frac{a(R - r^*)}{a + d} + \frac{di}{a + d}$$

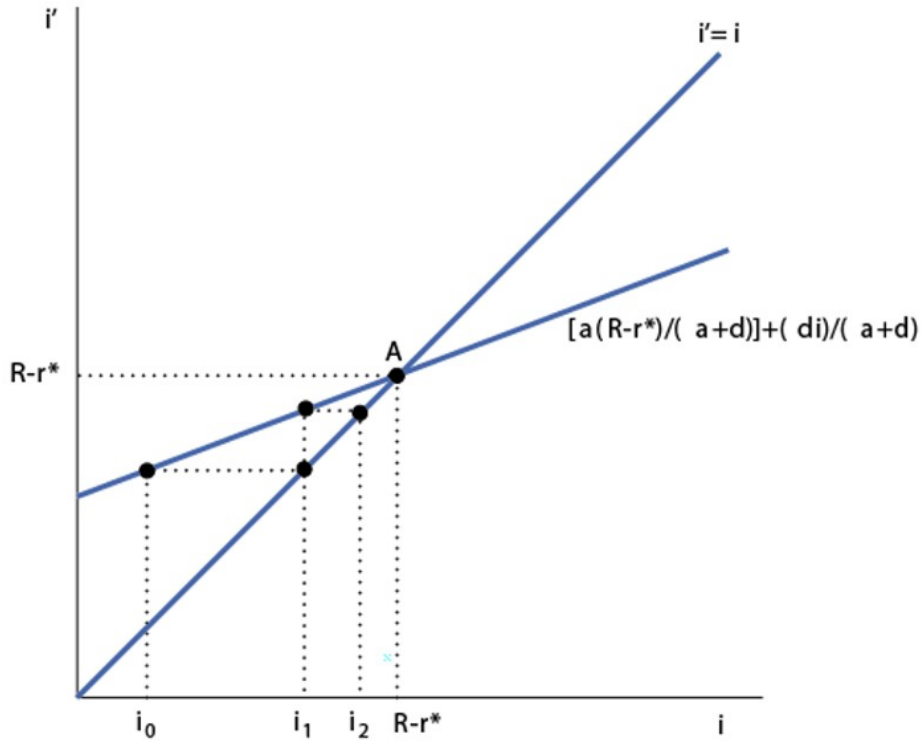
- This determines inflation, given an initial value i_0.

- I think a better equation is:

$$\Delta i = -\frac{a}{d}(r - r^*)$$

- But both say that R is constant, then inflation will converge to some level

New Keynesian Rational Expectations Model



Point A is the steady state inflation level

Long-Run Equilibrium

- What is long-run inflation? $i = i'$

$$i' = \frac{a(R - r^*)}{a + d} + \frac{di}{a + d}$$

- Turns to:

$$i = \frac{a(R - r^*)}{a + d} + \frac{di}{a + d}$$

- Solving:

$$i = R - r^*$$

- The long run Fisher equation!
- Here, the Fisher effect is *causal*: the long-run inflation rate will be the nominal interest rate minus the real equilibrium interest rate
- The sense is that if r^* is tied down by human impatience, then given an inflation rate we know what R must be, or given R inflation must be the difference between R and r^*.
- Higher interest rates mean higher inflation!

Short-Run Equilibrium

- What happens when we change R?
- Inflation starts to rise, and eventually plateaus until $i = R - r^*$, with the new higher R
- Even in short run, R leads to higher i (contrary to much of what we "know"!)

Taylor Rule Problems?

- How does the Taylor rule do in our new-ish model?
- Nominal interest rates, bounded at zero, take the form:

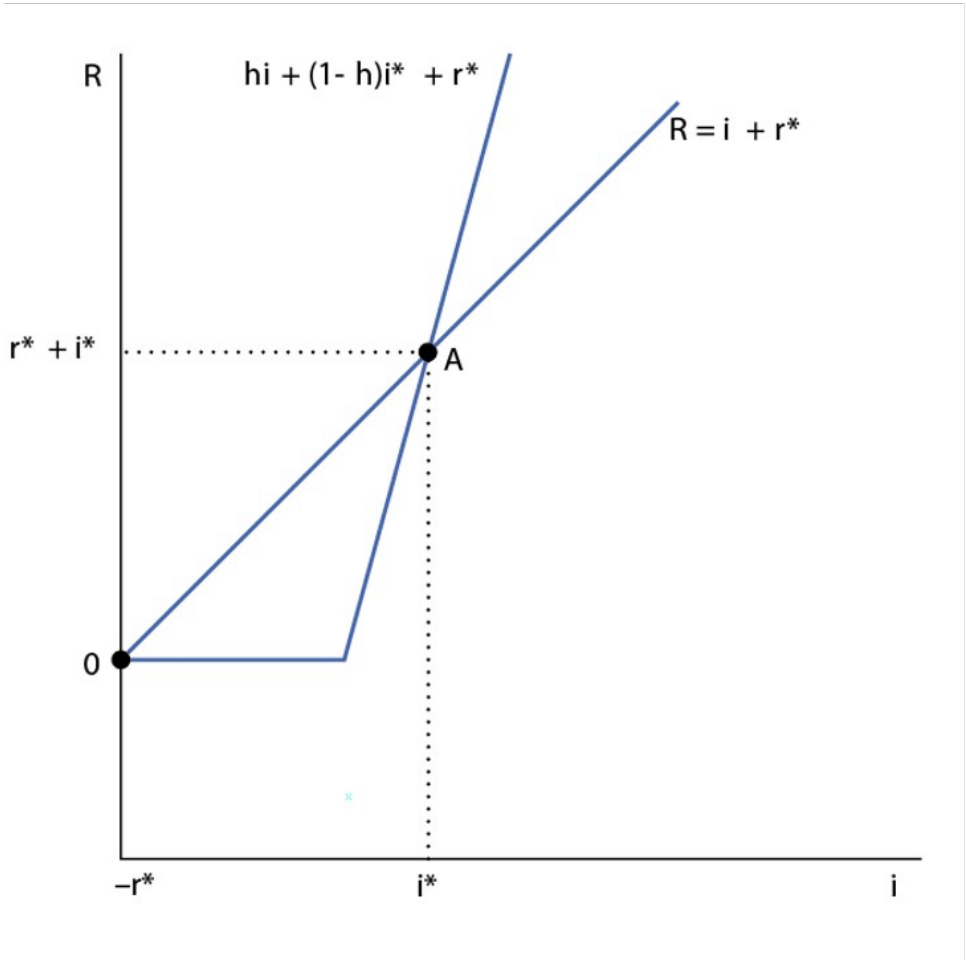
$$R = max\left(0, hi + (1-h)i^* + r^*\right)$$

- Idea: for now, forget output gap, just look at inflation
- Higher R when inflation is higher, lower when target i^* is higher, and higher when natural real interest rate r^* is higher
- We get, when $h > 1$ (the recommendation):

$$\begin{cases} R = 0 & \text{if } i \leq \frac{h-1}{h} i^* - \frac{r^*}{h} \\ hi + (1-h)i^* + r^* & \text{if } i \geq \frac{h-1}{h} i^* - \frac{r^*}{h} \end{cases}$$

- Let's draw it!

Our version of the Taylor Rule with ZLB



Euler equation/Output demand+Taylor has two equilibria!

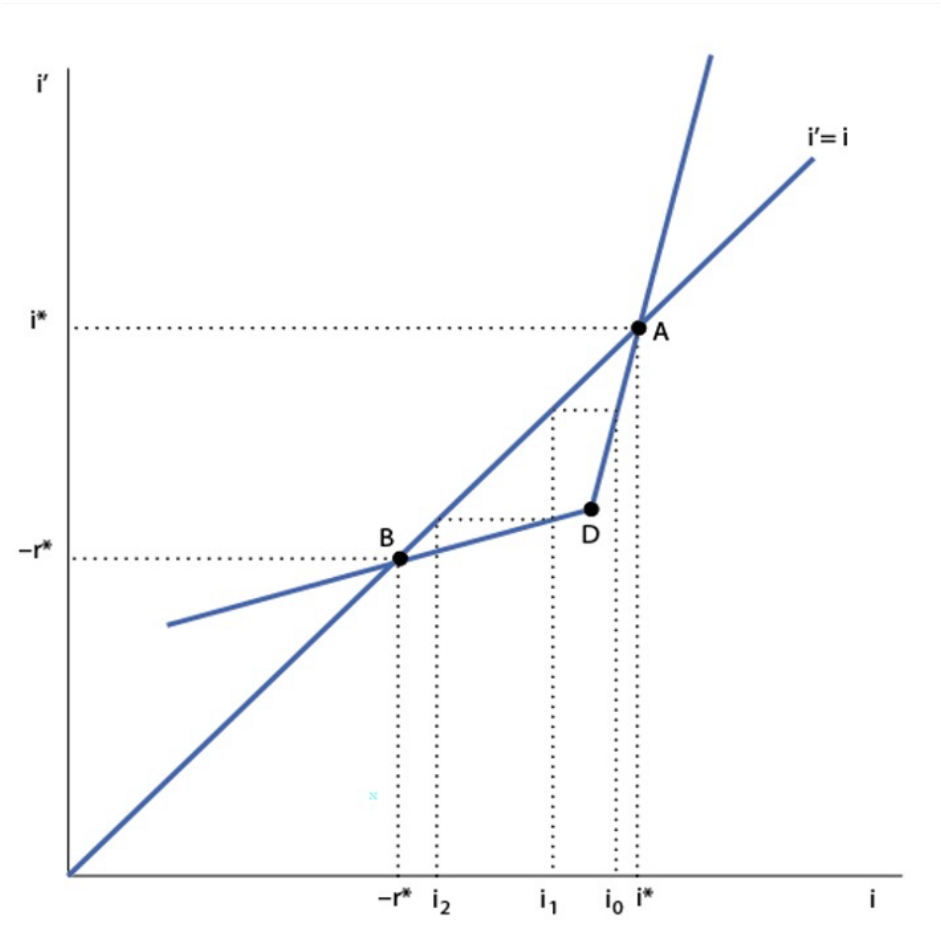
Exploring Further

- Now, take Taylor Rule and apply to Phillips Curve

$$i = max\left(\frac{ar^*}{a+d} + \frac{di}{a+d}, \frac{(ah+d)i}{a+d} + \frac{a(1-h)i^*}{a+d}\right)$$

- We have piecewise linear (kinked) relationship between i and i', let's graph

Our version of the Taylor Rule with ZLB



Euler equation/Output demand+Taylor has two equilibria! i above d converges to positive inflation, i below d converges to zero.

Basic Idea/Logic

- Taylor rule says to react to higher inflation by increasing R, lower inflation by decreasing R
- Fisher effect in NKRE says higher R gives higher inflation, lower R gives lower inflation
- So if low, then lower R (Taylor rule) then lower inflation (Fisher effect), then lower R....
- And if high, then higher R (Taylor rule) then higher inflation (Fisher effect), then higher R....
- Multiple equilibria!
- This problem with the Fisher effect isn't just the NKRE model, it's basically everything with an Euler Equation!

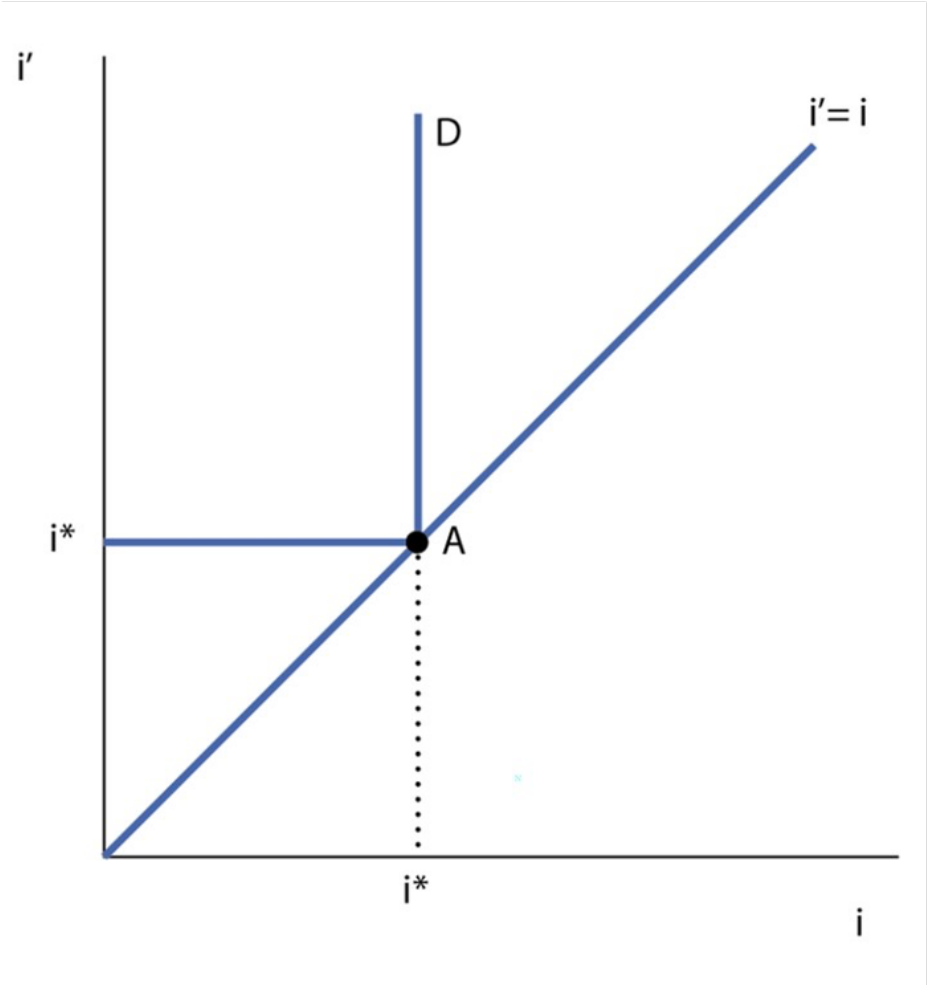
Solving the Problem

- Instead, could just increase R when inflation needs to be higher
- We could instead choose to raise R when we want higher inflation, and lower it when current inflation is too high (flip of Taylor)

$$R = \begin{cases} r^* + \frac{(a+d)i^*}{a} - \frac{d}{a}i & \text{if } i < i^* \\ r^* - \frac{d}{a}i^* + \frac{(a+d)i^*}{a} & \text{if } i \geq i^* \end{cases}$$

- When we do this, we get what we want, in both cases above, $i' = i^*$

Inflation Under a Neo-Fisherian Monetary Policy Rule



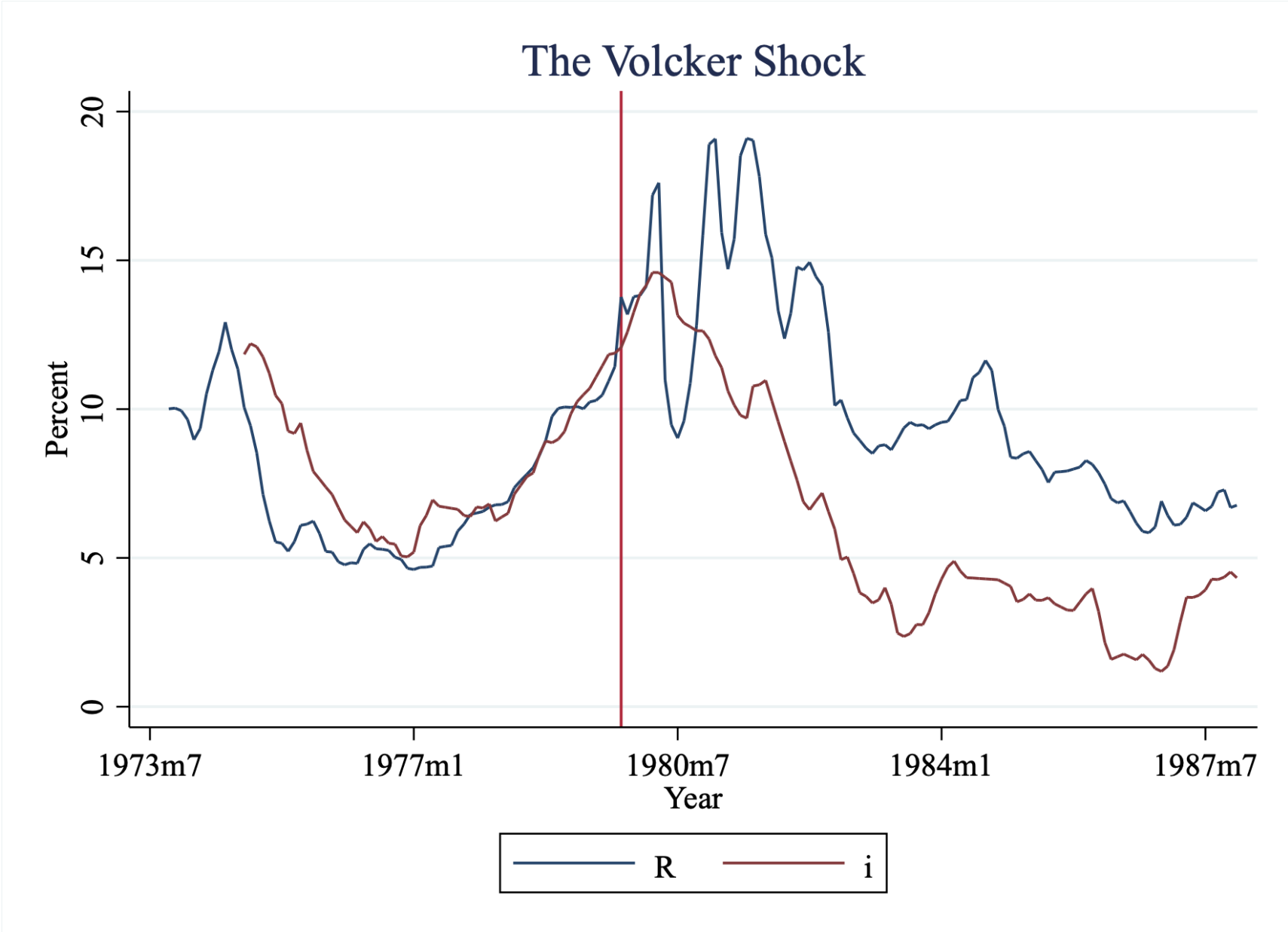
Idea

- Euler equation/output demand relates output today and tomorrow with nominal interest rates, inflation, and human impatence ("natural real rate)
- Phillips curve relates output demand today and tomorrow with inflation today and tomorrow
- Combining, we get that the change in inflation relates to nominal interest rates (-) and human impatience (+)
- If inflation too low, raise nominal interest rate, which increases inflation tomorrow relative to today (moves us toward right path)
- Lower nominal interest rates lowers consumption (output) growth, which lowers inflation tomorrow
- Higher nominal interest rates increase consumption (output) growth, raising inflation tomorrow

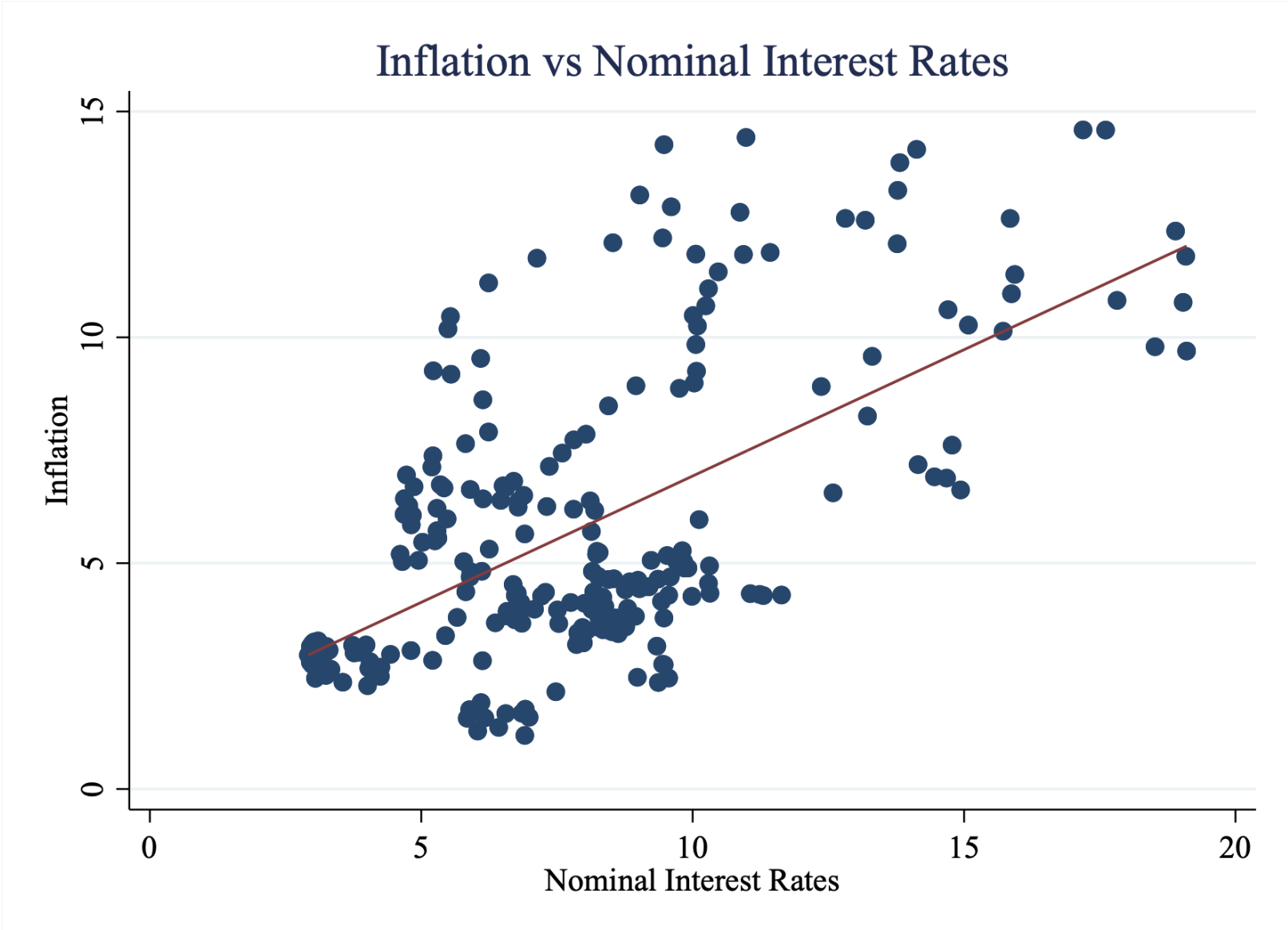
My own take

- This model makes sense!
- I "want" to be a Neo-Fisherian
- But some stories hold me back: "Volcker Shock"
- Claim: Paul Volcker came into office in October 1979, and changed policy, dramatically increased nominal interest rates, and inflation fell
- Treated as similar to a "natural experiment"

Volcker Shock



But Neo-Fisherians have something to work with!



Conclusions

- Even the NK model has some wrinkles
- Subtle wrinkles can totally upend even the *direction* of policy advice!
- Currently these Neo-Fisherian theories are not commonly accepted
- But as I say, they keep me up at night
- Next we turn to open economy macro: trade, etc.!