

Low Inflation, Phillips Curves, and Neo-Fisherism

Stephen Williamson
Federal Reserve Bank of St. Louis

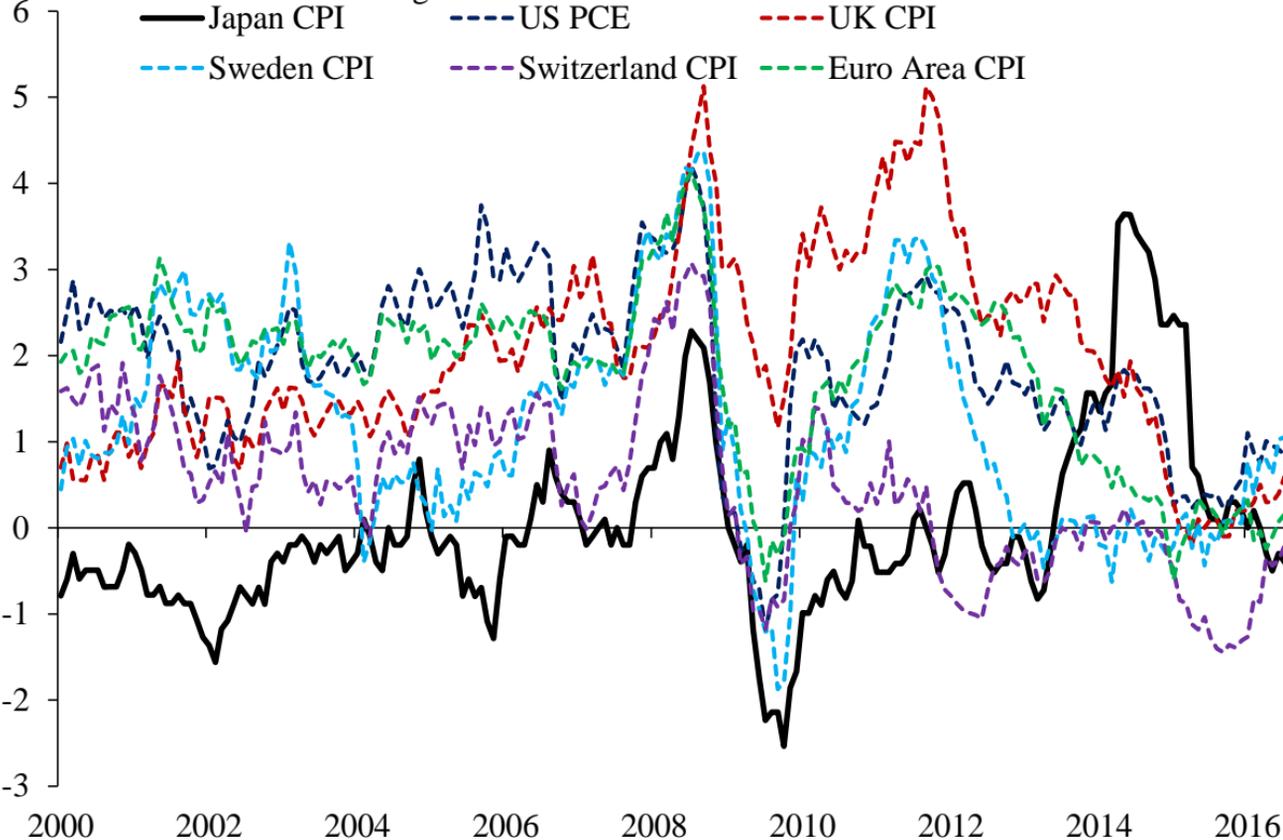
November 2016

The views expressed are mine and do not necessarily reflect official positions of the Federal Reserve Bank of St. Louis, the Federal Reserve System, or its Board of Governors.

- Recent history of low inflation in the world.
- Conventional undergraduate macro theory of inflation – Phillips curves.
- Central bankers' views of what is causing low inflation, and how to fix it.
- Observed Phillips curves.
- Neo-Fisherism and inflation.
- Low real interest rates.

World Inflation Rates

Year-Over-Year Percent Change



Sources: Bureau of Economic Analysis and OECD/Haver Analytics

Conventional Undergraduate Macro Theory of Inflation

- IS curve:

$$y = a - \frac{1}{b}r$$

- Phillips curve:

$$i = d(y - y^*) + i^e$$

- Fisher relation:

$$R = r + i^e$$

- y = output; r = real interest rate; i = inflation rate; y^* = potential output; i^e = anticipated future inflation; R = nominal interest rate.
- Endogenous: i, y . Exogenous: y^*, i^e, R .

Solution to the Conventional Model

- Output:

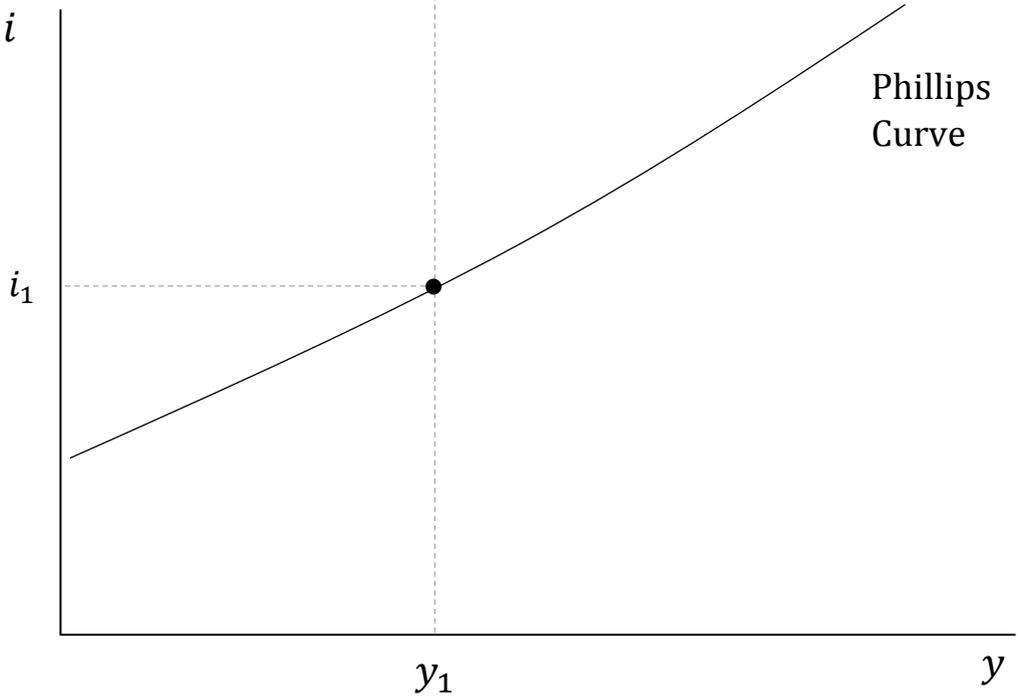
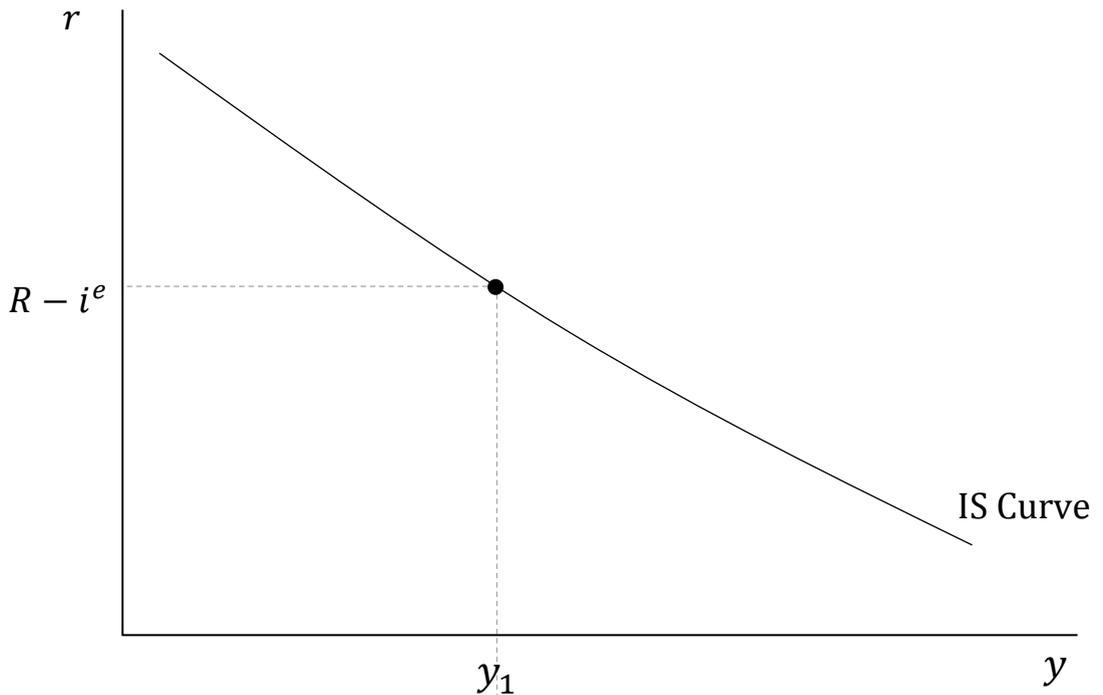
$$y = a - \frac{1}{b}(R - i^e)$$

- Inflation:

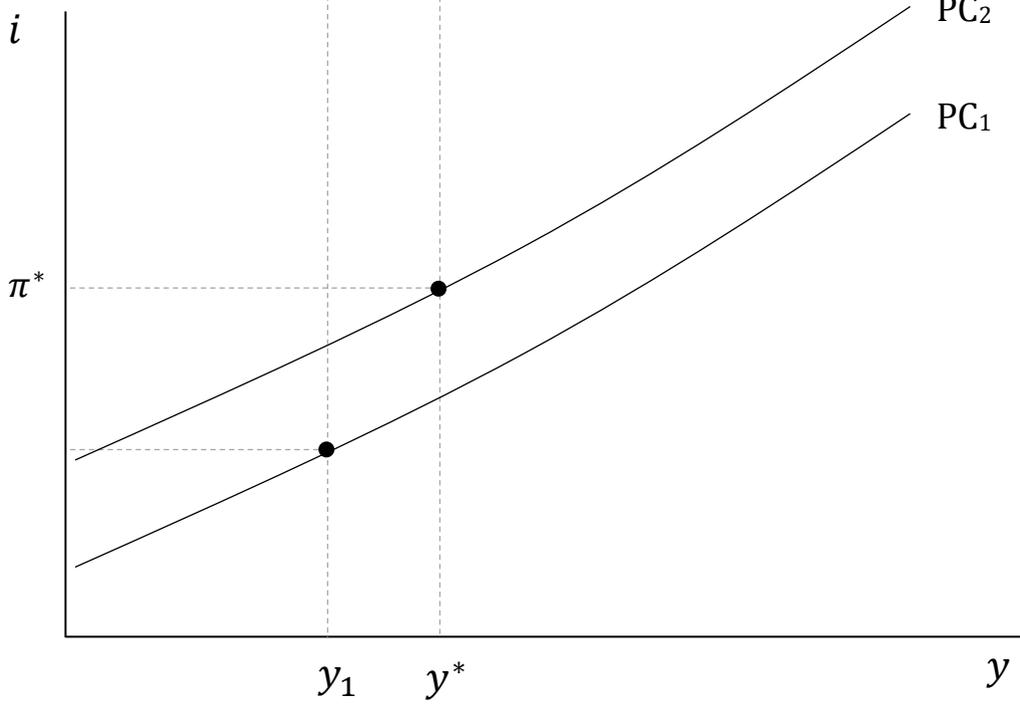
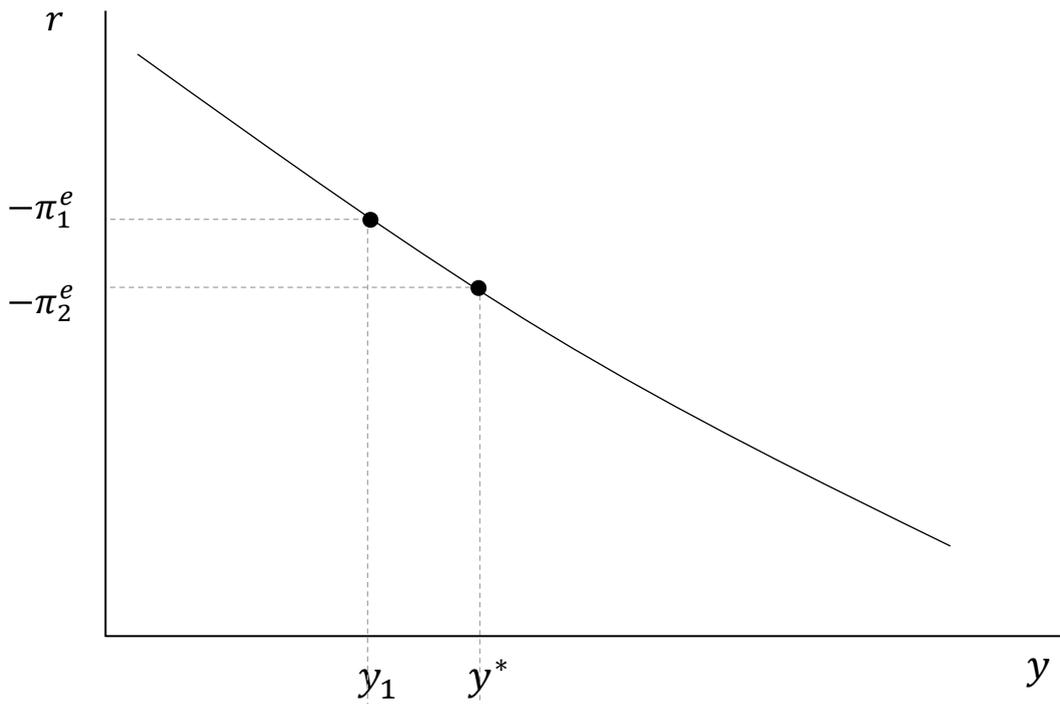
$$i = \left(1 + \frac{d}{b}\right) i^e - \frac{d}{b}R - dy^*$$

- So, increase in R reduces output and inflation.
- Real interest rate goes up, output goes down, and inflation declines because of a Phillips curve effect.

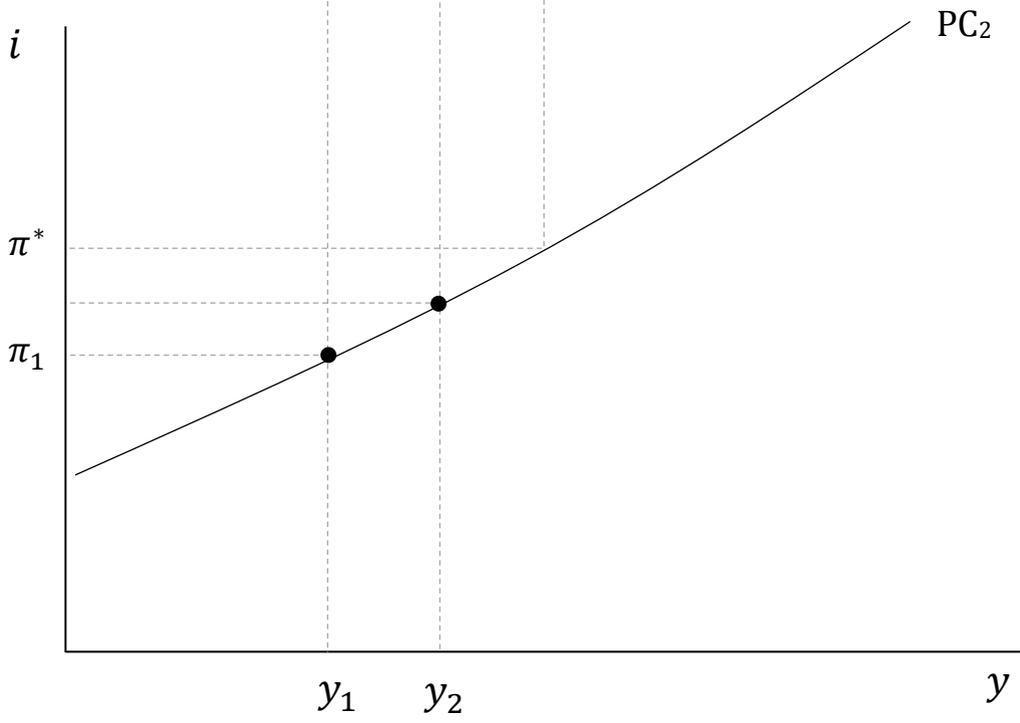
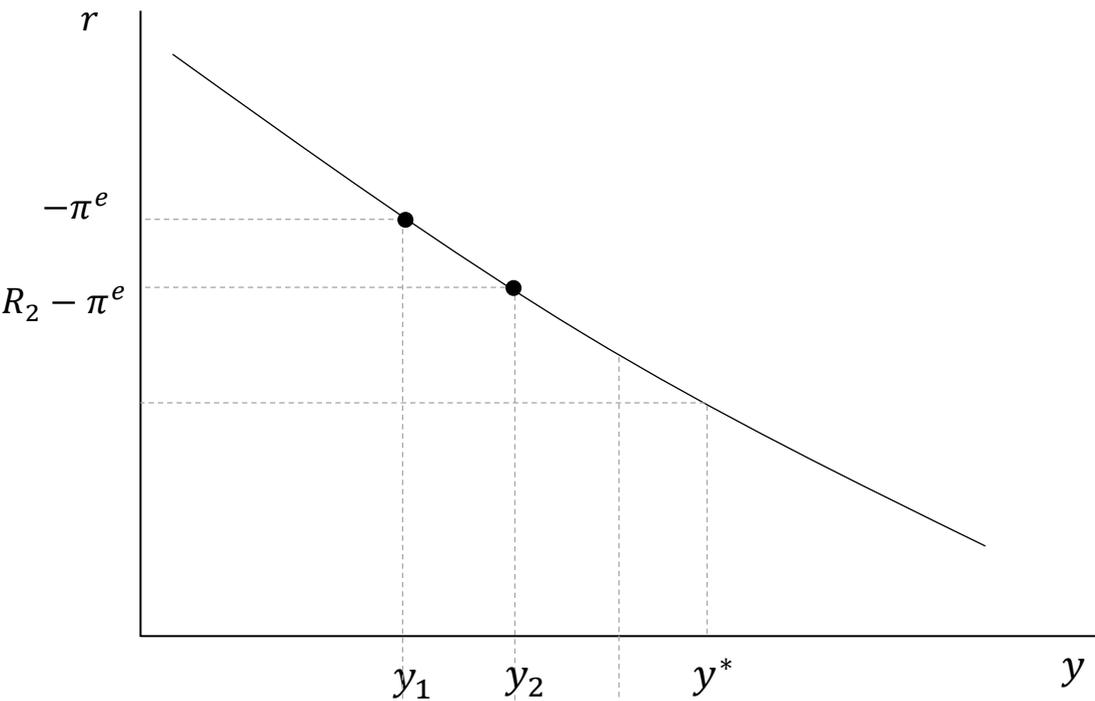
Conventional Model



Zero Lower Bound: Forward Guidance



Zero Lower Bound: Negative Nominal Rate



Conventional Central Banking

- From the September 21, FOMC statement:

The Committee judges that the case for an increase in the federal funds rate has strengthened but decided, for the time being, to wait for further evidence of continued progress toward its objectives. The stance of monetary policy remains accommodative, thereby supporting further improvement in labor market conditions and a return to 2 percent inflation.

- Seems consistent with the conventional model.
- Low nominal interest rate means that inflation is expected to rise, though we might have to wait for it.

Another Example of Conventional Central Banking: Swedish Riksbank

- From the Riksbank's "Monetary Policy Report," October 2016:

...monetary policy in Sweden has been characterised by low domestic inflation...

...The Riksbank has cut the repo rate to -0.50 per cent and carried out extensive purchases of government bonds...

...The aim of the expansionary monetary policy is to push up inflation and stabilise it around the target of 2 per cent and help keep inflation expectations in line with the inflation target...

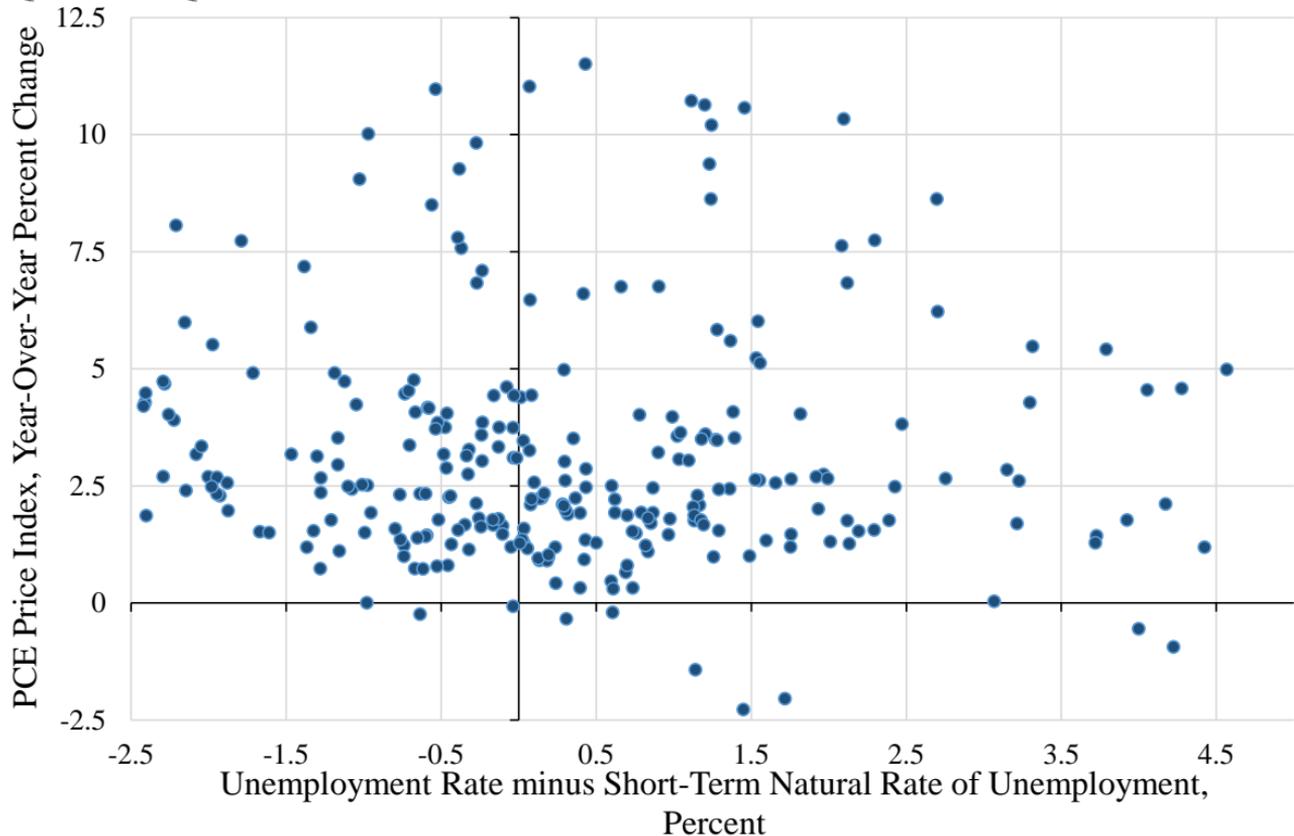
...inflation has slowed down this year...

...When resource utilisation in the economy rises, it normally affects the rate of price increase with a certain time lag...

The Executive Board...assesses that the repo rate needs to be held at the current low level, -0.50 per cent, for six months longer than was assumed in September...

Phillips Curve?

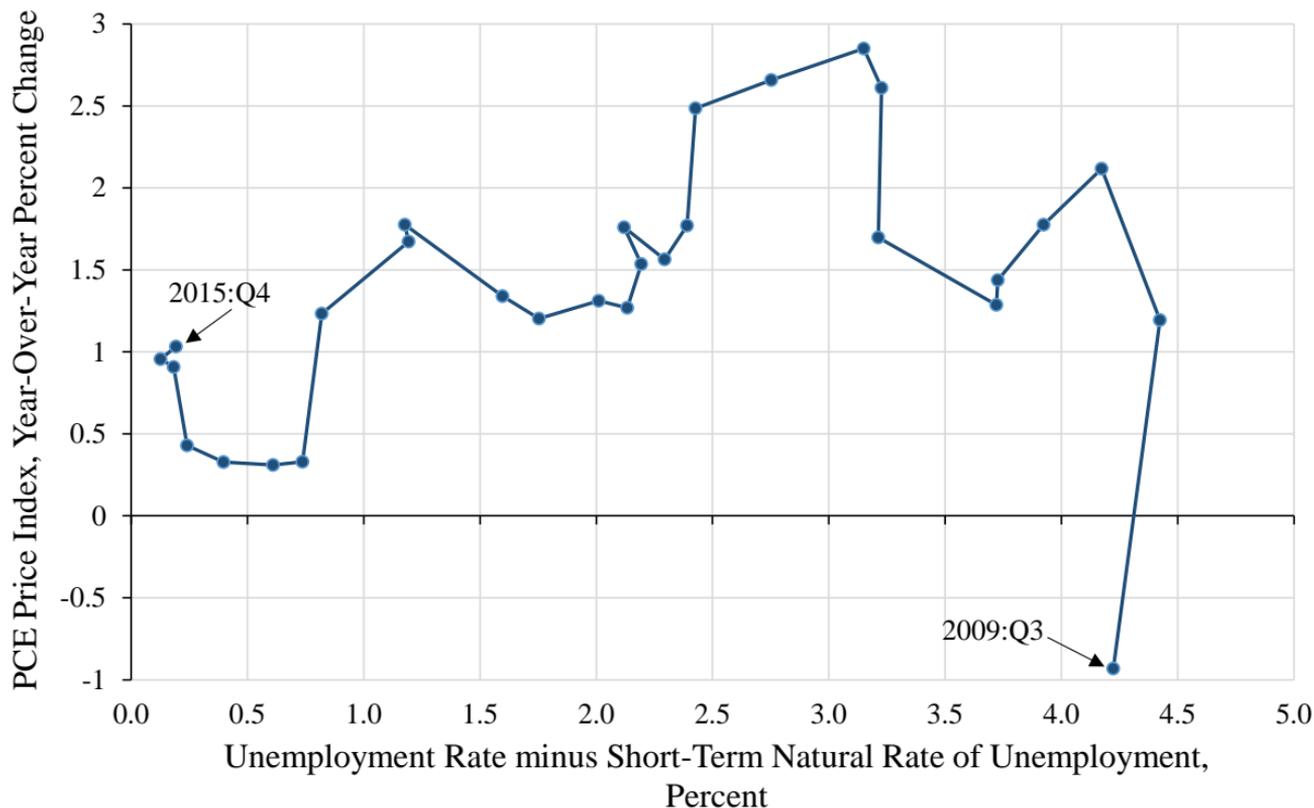
Q1:1949 to Q3:2016



Sources: Bureau of Economic Analysis, Bureau of Labor Statistics,
and Congressional Budget Office/FRED

Phillips Curve?

Q3:2009 to Q3:2016



Sources: Bureau of Economic Analysis, Bureau of Labor Statistics, and Congressional Budget Office/FRED

- Even in models with a Phillips curve, higher R can mean higher i .
- Simple New Keynesian model with no aggregate uncertainty:

$$\text{[IS curve]} \quad y_t - y_{t+1} = -\frac{1}{b}(R_t - i_{t+1} - r^*)$$

$$\text{[Phillips curve]} \quad i_t = d(y_t - y^*)$$

- r^* = natural real rate of interest
- Solve for inflation:

$$i_{t+1} = \frac{d}{b+d}(R_t - r^*) + \frac{b}{b+d}i_t$$

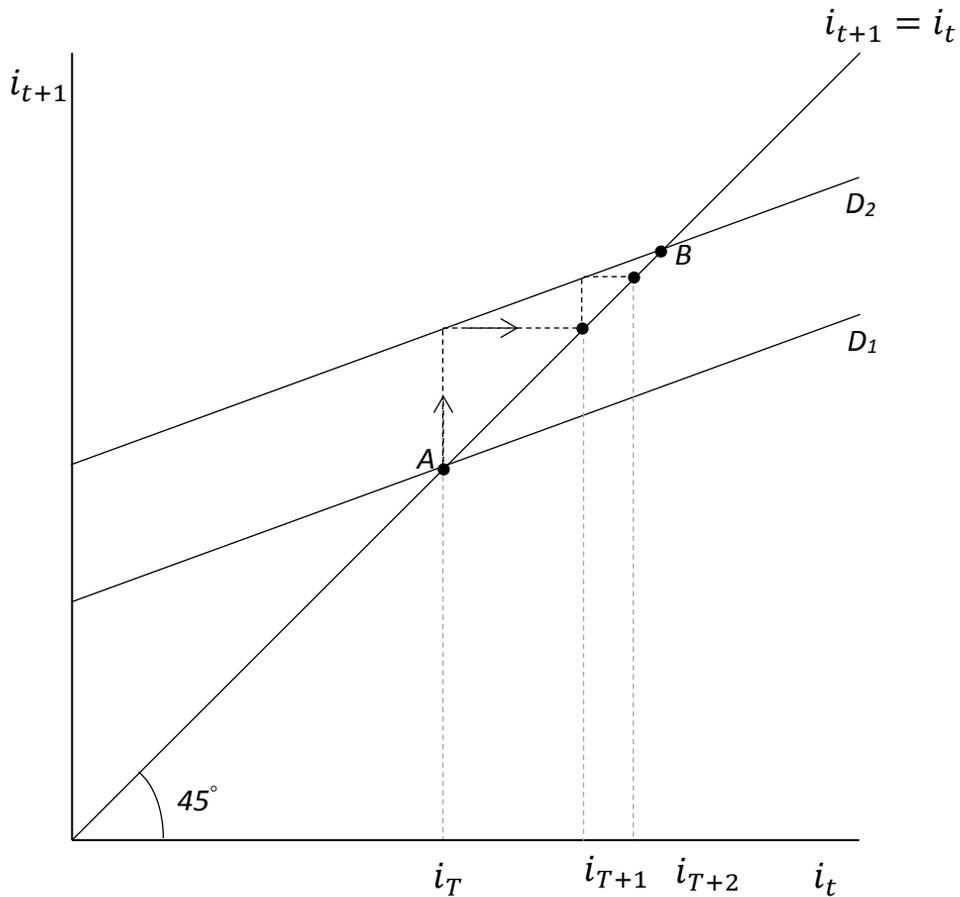
New Keynesian Model

- Fixed nominal interest rate R forever implies Fisher relationship in the long run:

$$i = R - r^*$$

- Permanent increase in the nominal interest rate implies that inflation goes up – never goes down.

Increase in the Nominal Interest Rate



Standard Taylor Rule

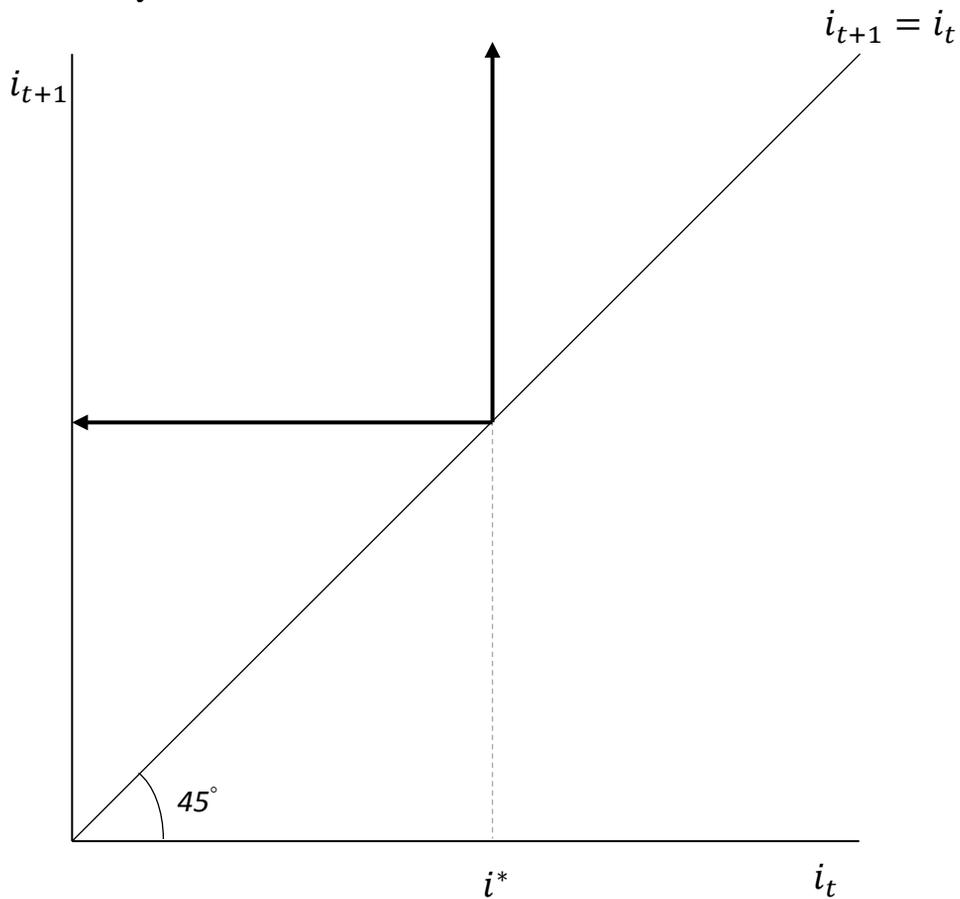
$$R_t = \max[0, r^* + f i_t + (1 - f) i^*]$$

- $\pi^* =$ inflation target.
- If $f > 1$, this implies two steady states: (i) $i = i^*$ and $R = r^* + i^*$; (ii) $i = -r^*$ and $R = 0$.
- Can get stuck at the undesired steady state with low inflation and $R = 0$: central banker thinks that aggressively cutting rates will increase inflation, but it doesn't happen.

A Better (and neo-Fisherian) Rule

- If $i_t < i^*$, $R_t = r^* + \frac{b+d}{d}\pi^* - \frac{b}{d}\pi_t$.
- If $i_t \geq i^*$, $R_t = r^* - \frac{b}{d}\pi^* + \frac{b+d}{d}\pi_{t+1}$.
- First part of the rule responds to current inflation below target – brings inflation back to target next period.
- Second part of the rule responds to current inflation potentially above target, by killing off high incipient future inflation that supports it, thus keeping current inflation on target.
- Always increase interest rates in response to inflation off-target (but won't always do it in equilibrium).

Neo-Fisherian Taylor Rule

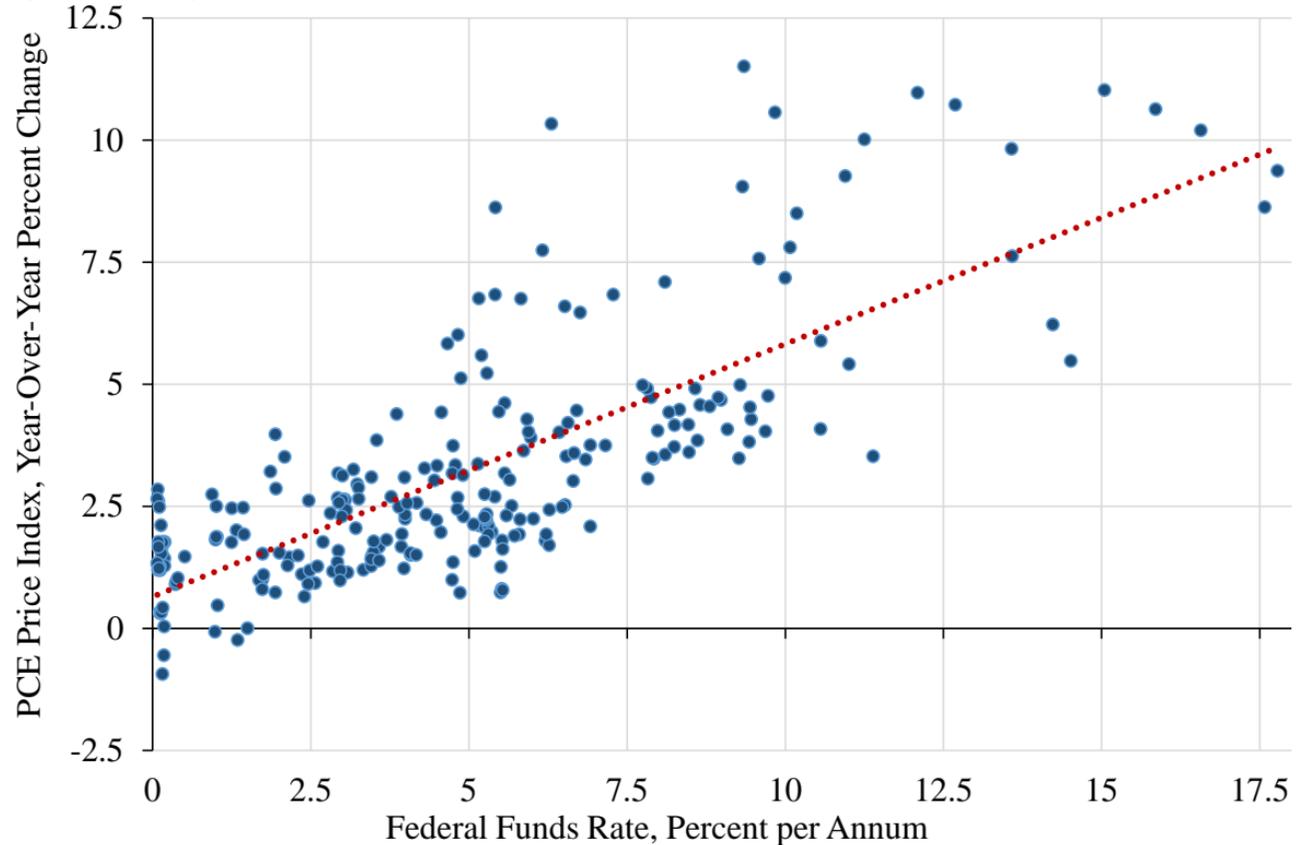


Empirical Regularities

- Observe the long-run Fisher relation in the data.
- Low-nominal interest rate countries tend to have low inflation rates:
 - Japan: more than 21 years of low nominal interest rates and low inflation.
 - Switzerland: one of the first countries with negative nominal interest rates – also has deflation.
 - Sweden: Riksbank's forecasts of interest rates and inflation consistently miss on the low side.
- What do countries stuck in a low-inflation trap do? Unconventional monetary policy:
 - Negative nominal rates (on reserve balances) – neo-Fisherites say this just makes inflation lower.
 - Large scale asset purchases (quantitative easing) – not clear this does anything significant.
 - Forward guidance – in practice, this does not work so well, as promises not met.

Empirical Fisher Relation

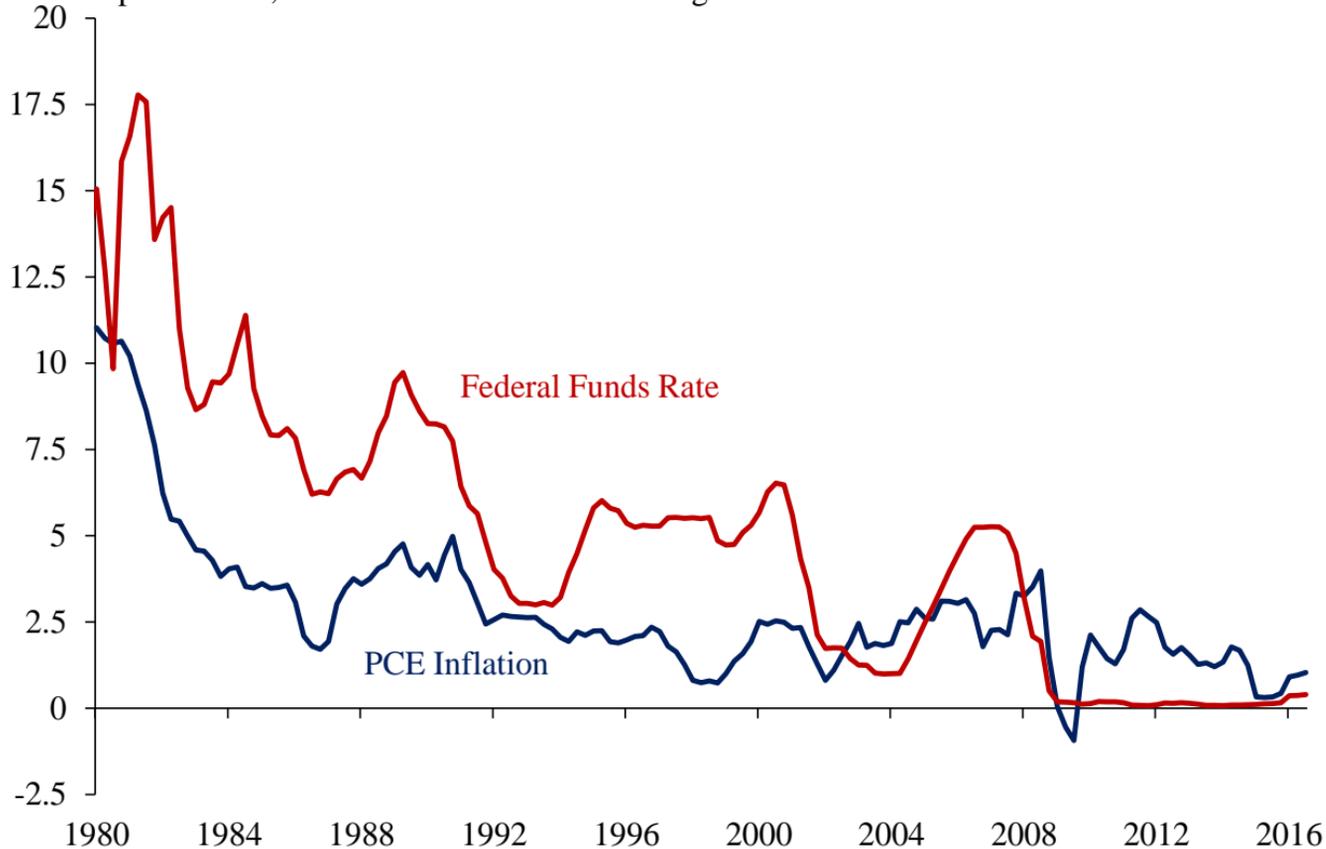
Q3:1954 to Q3:2016



Sources: Bureau of Economic Analysis and Federal Reserve Board/FRED

Nominal Interest Rate and Inflation

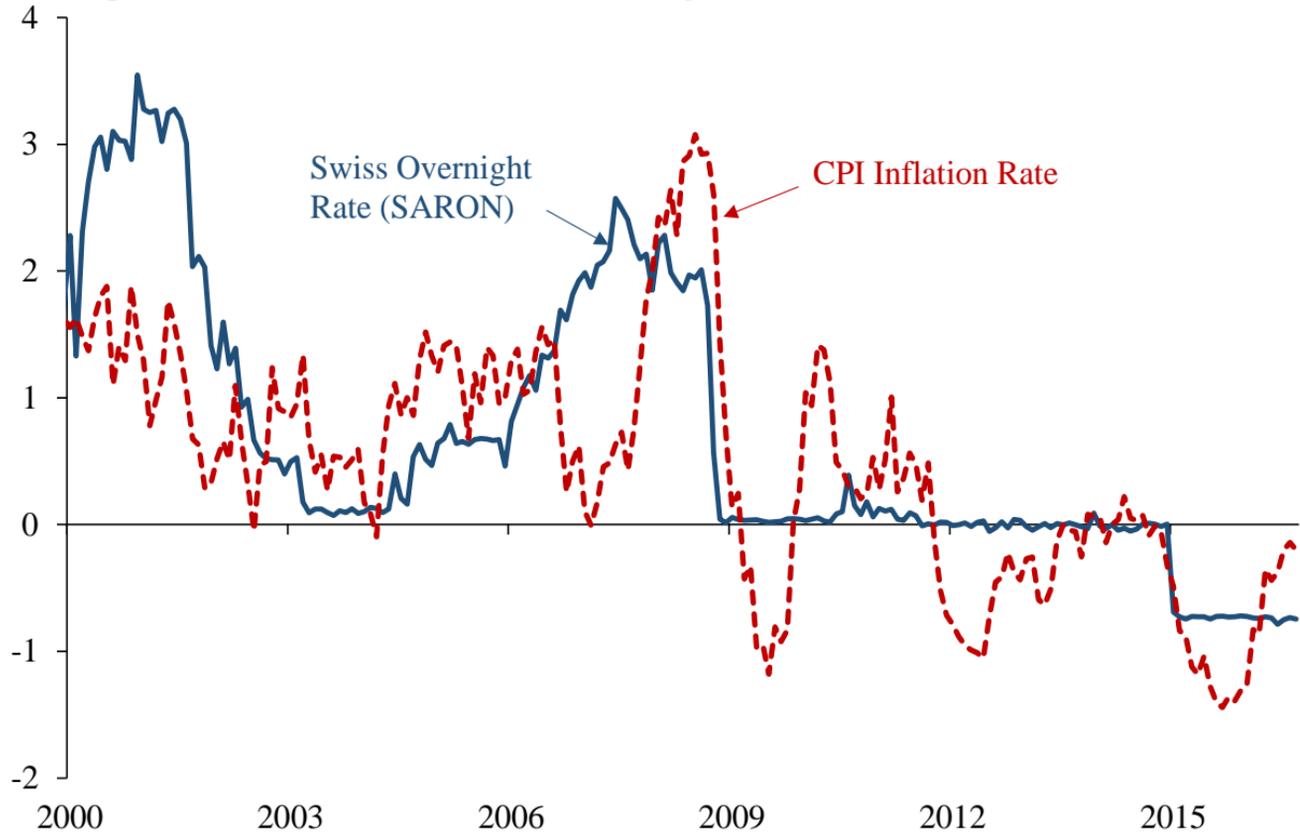
Percent per Annum; Year-Over-Year Percent Change



Sources: Federal Reserve Board and Bureau of Economic Analysis/FRED

Swiss Overnight Interbank Rate and Inflation

Percent per Annum; Year-Over-Year Percent Change

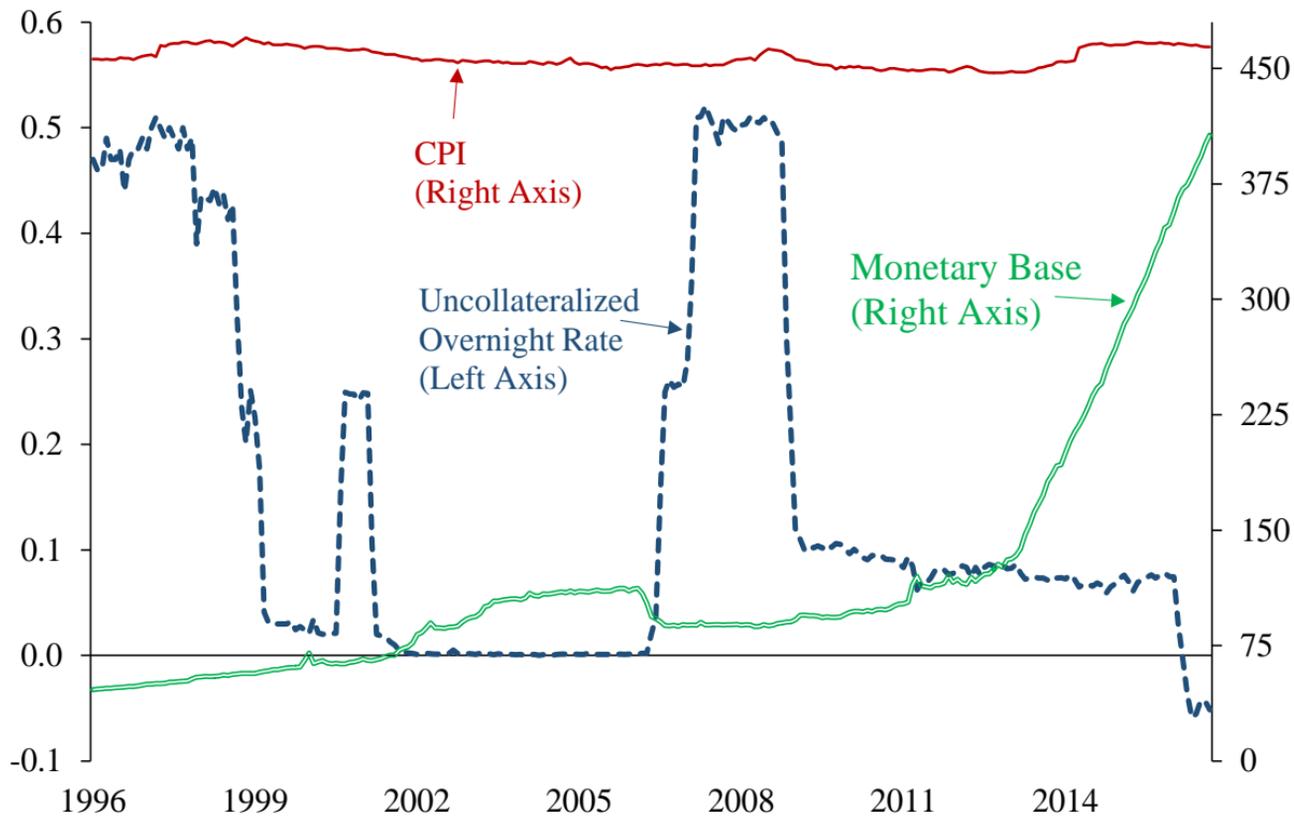


Sources: IMF/Haver Analytics and Swiss National Bank

Japan CPI, Overnight Rate, and Monetary Base

Percent per Annum

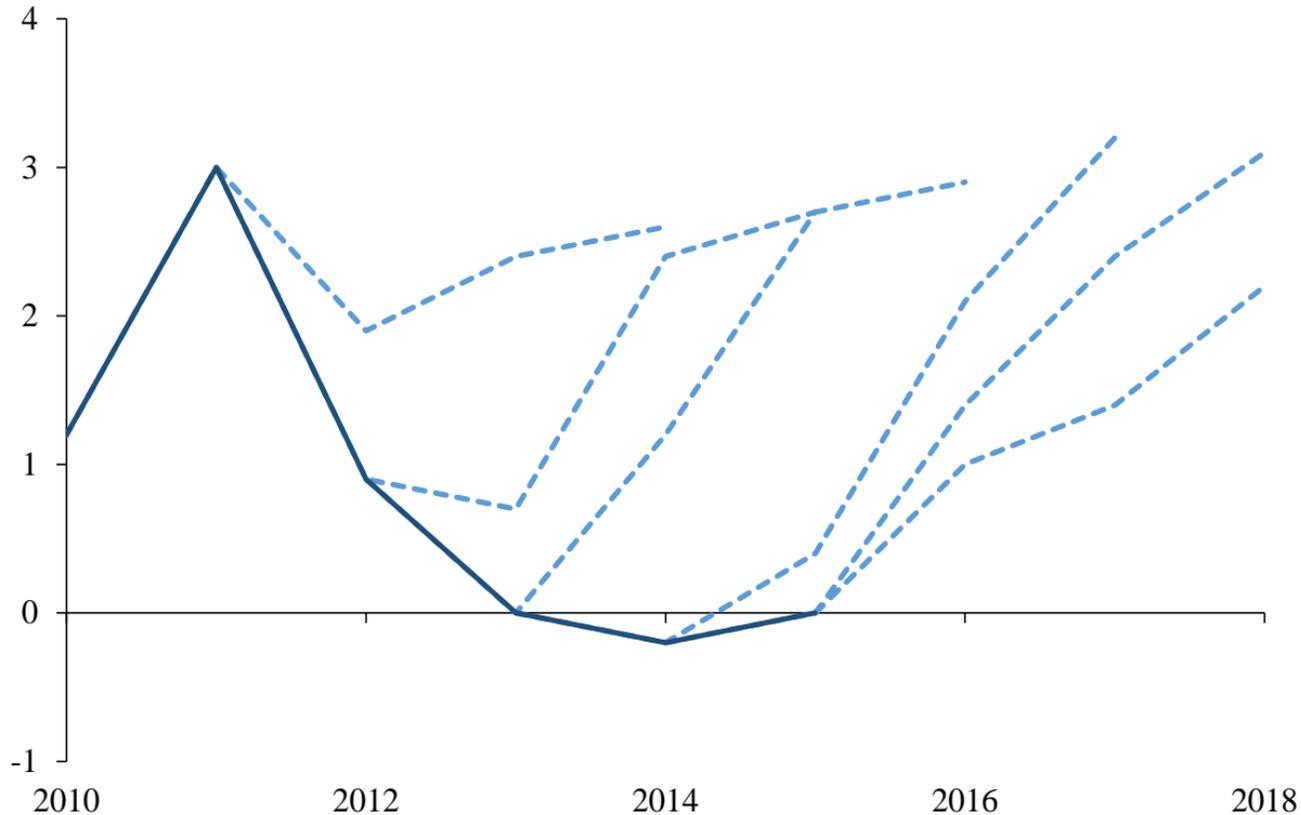
Index (2010=450); Trillions of Yen



Sources: Bank of Japan and OECD/Haver Analytics

Swedish Inflation Versus Inflation Forecasts

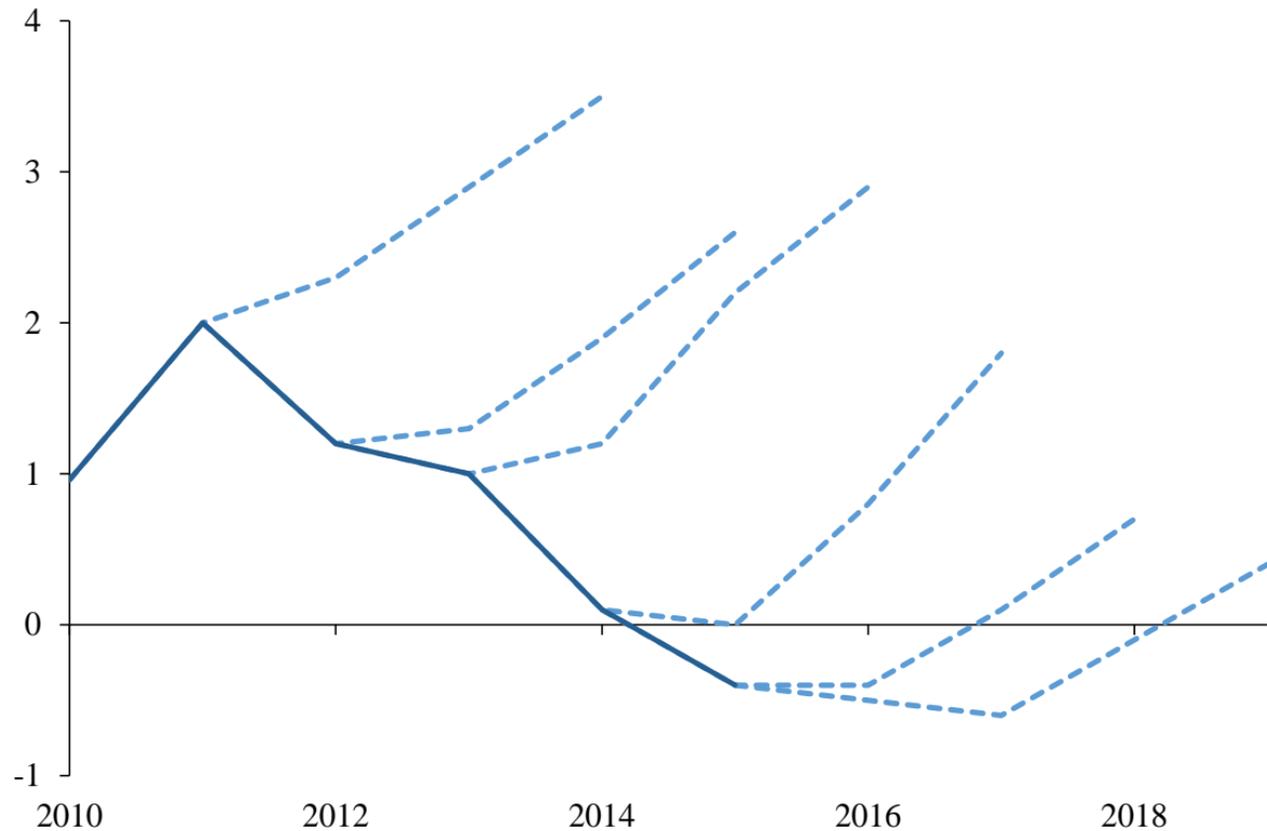
Annual Percent Change in CPI



Source: Swedish Riksbank (Forecasts from October Monetary Policy Reports 2011-2016)

Swedish Repo Rate Versus Repo Rate Forecasts

Average Rate for Q4 of Each Year, Percent

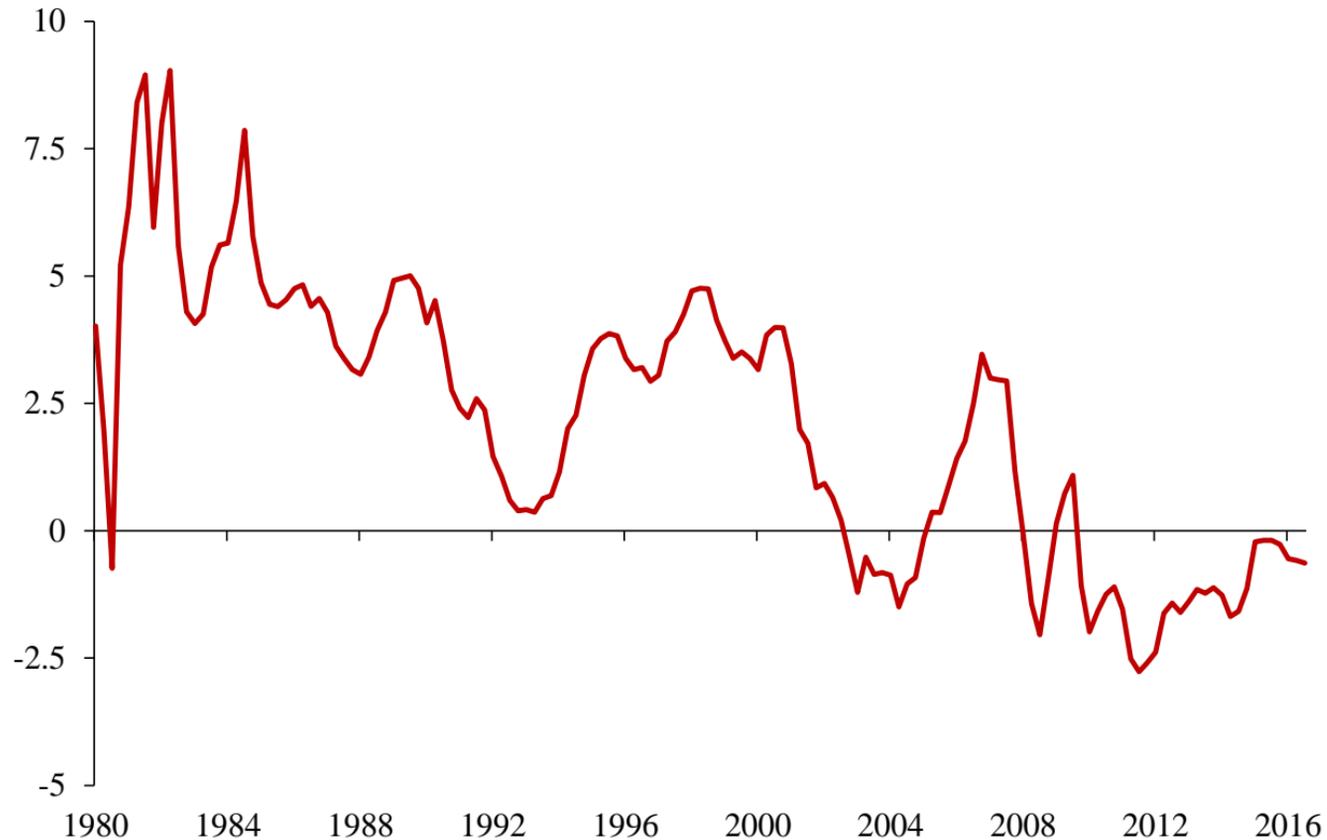


Source: Swedish Riksbank (Forecasts from October Monetary Policy Reports 2011-2016)

- Causes?
 - Summers: Dearth of investment opportunities.
 - Bernanke: World savings glut.
 - Shortage of safe assets – makes real return on government debt low, not rate of return on capital.
- Implication: See higher inflation when nominal interest rates are low.

Real Interest Rate

Real Federal Funds Rate, Percent per Annum



Sources: Federal Reserve Board and Bureau of Economic Analysis/FRED

- Undergraduate macro and standard central bank practice say that raising nominal interest rates lowers inflation.
- Mainstream models (NK and others) and empirical evidence suggest otherwise.
- What's the cost of getting it wrong?
 - Inflation stays below target – may not be so bad, particularly with persistent low real interest rates.
 - Effort and central bank credibility wasted on ineffective or harmful unconventional monetary policies.