2017 Federico Caffè Lectures

Monetary Policy in Times of Low Inflation

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Lecture 1:
(a) Empirical evidence on recoveries from deep recessions with liquidity traps: they are jobless, inflation is below target, rates are stuck at zero, real wages hold up well although TFP growth is weak.
(b) One explanation, in fact the most widely embraced one, is that such dynamics are the consequence of a long string of negative natural rate surprises.

Lecture 2:
(a) Another explanation, less widely embraced, is that such dynamics are the consequence of an un-anchoring of long-run inflation expectations.
(b) Raising nominal interest rates as a strategy to lift an economy out of a liquidity trap — the neo-Fisher effect.
(c) Empirical evidence on the neo-Fisher effect.

(a) Explaining jobless recoveries from deep recessions with liquidity traps as a consequence of a negative confidence shock:

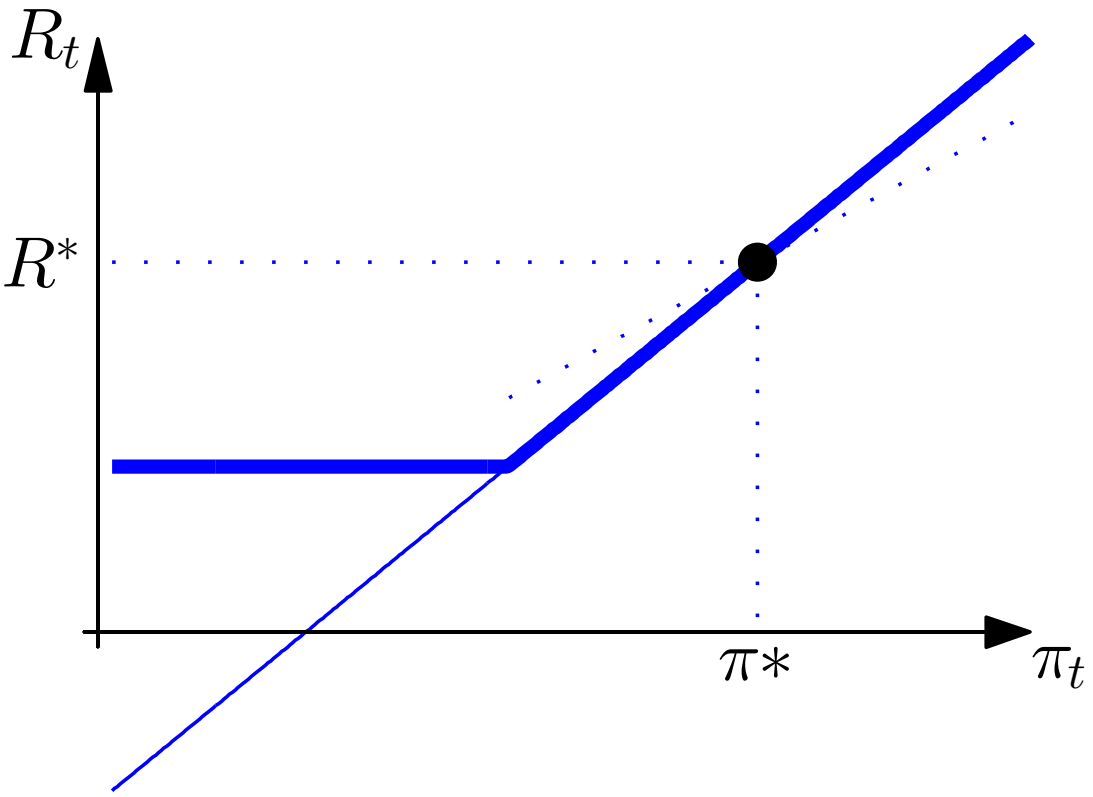
1. Monetary Policy follows a Taylor Rule.

2. The Zero Lower Bound On Nominal Interest Rates.

3. Downward Nominal Wage Rigidity.

4. A Downward Revision in Inflation Expectations.

Monetary Policy: a Taylor-Rule that respects the zero lower bound



$$R_t = \max\{1, R^* + \alpha_\pi (\pi_t - \pi^*)\}$$

- R_t = (gross) nominal interest rate
- π_t = (gross) inflation rate
- R^* = nominal interest rate target
- π^* = inflation rate target
- $\alpha_\pi > \beta^{-1} > 1$, inflation sensitivity of interest-rate feedback rule

The Consumption Euler Equation

$$U'(C_t) = \beta R_t \mathbb{E}_t \left\{ \frac{U'(C_{t+1})}{\pi_{t+1}} \right\}$$

where

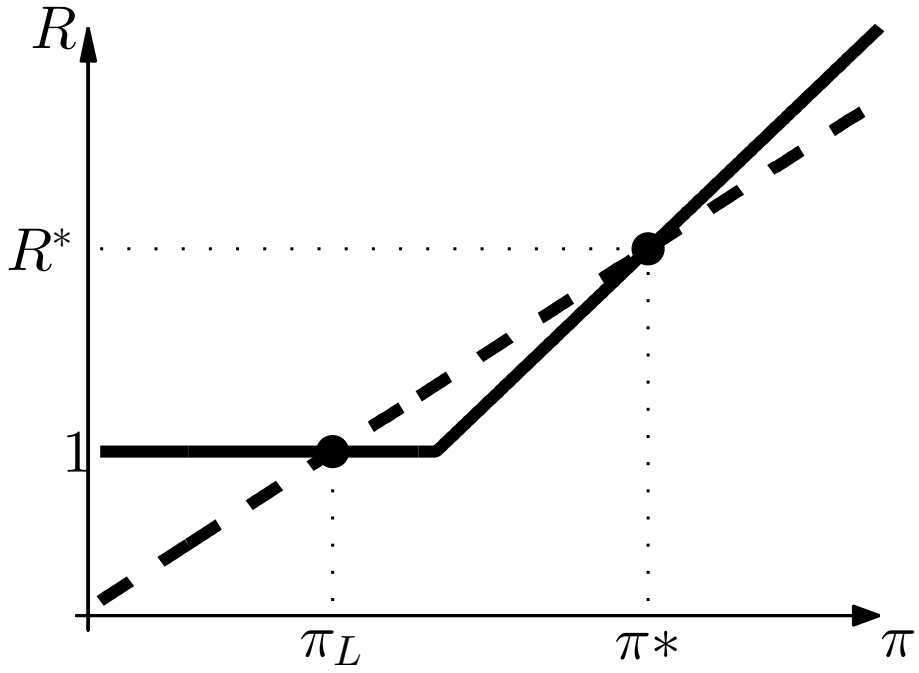
- $C_t =$ consumption in period t
- $\mathbb{E}_t =$ conditional expectations operator
- $R_t =$ (gross) nominal interest rate
- $\pi_{t+1} =$ (gross) inflation rate between t and $t+1$
- $U(.) =$, period utility function, $U' > 0$.

Steady State Equilibria

In a steady state, the Taylor rule and the Euler equation become, respectively,

$$R = \frac{\pi}{\tilde{\beta}}$$

$$R = \max\{1, R^* + \alpha_\pi (\pi - \pi^*)\}$$

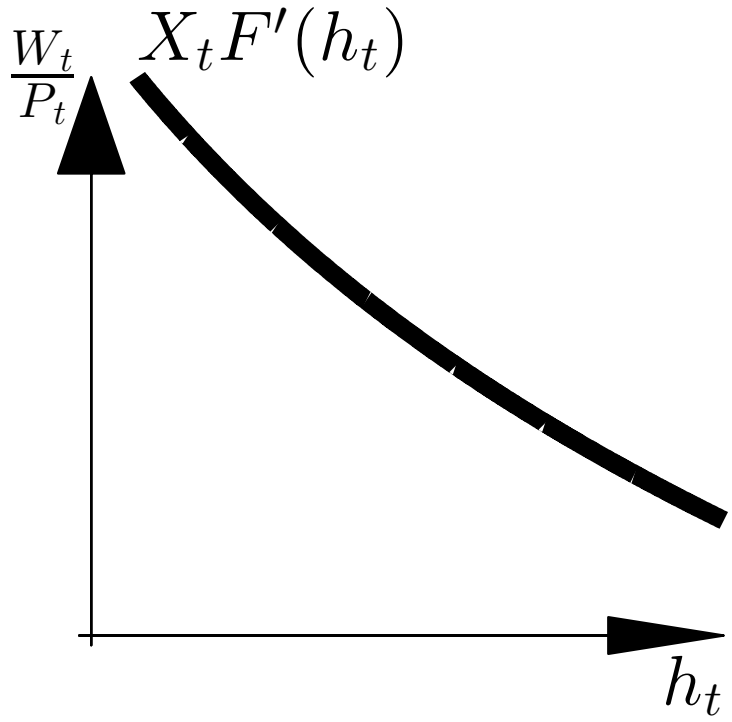


Solid Line:
$R = \max\{1, R^* + \alpha_\pi (\pi - \pi^*)\}$
Broken Line:
$R = \tilde{\beta}^{-1}\pi$
$\Rightarrow$ **The Perils of Taylor Rules:** There exist two steady-state equilibria: π^* and π_L

Labor Demand by Firms

Production function: $Y_t = X_t F(h_t)$,
where

- $Y_t =$ output
- $X_t =$ total factor productivity (TFP), assumed to be exogenous
- $h_t =$ hours
- $X_t/X_{t-1} = \mu > 1$, gross growth rate of TFP



Labor demand:

$$\frac{W_t}{P_t} = X_t F'(h_t),$$

where

- $W_t =$ nominal wage rate
- $P_t =$ price level

Downward Nominal Wage Rigidity

$$W_t \geq \gamma(u_t) W_{t-1},$$

where

- $W_t =$ nominal wage rate
- $u_t =$ unemployment rate

Assumption: $\gamma'(u_t) < 0$, nominal wages become more downwardly flexible as unemployment increases.

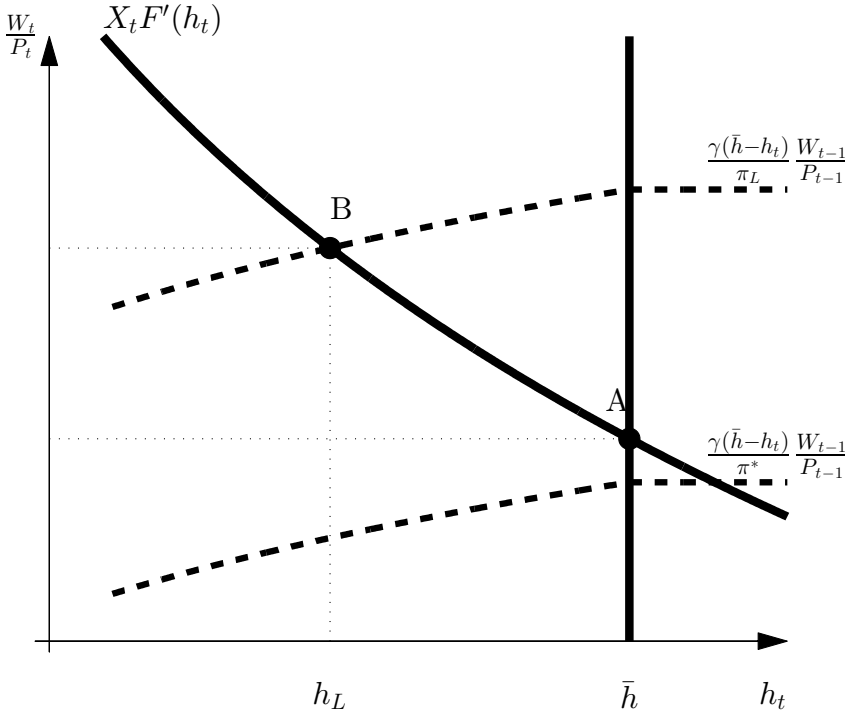
The Labor Market

Labor Demand: $\boxed{\frac{W_t}{P_t} = X_t F'(h_t)}$

Inelastic Labor Supply: $\boxed{h_t \leq \bar{h}}$

Unemployment: $\boxed{u_t = \bar{h} - h_t}$

Downward Wage Rigidity: $W_t \geq \gamma(u_t) W_{t-1} \Rightarrow \boxed{\frac{W_t}{P_t} \geq \frac{\gamma(\bar{h}-h_t)}{\pi_t} \frac{W_{t-1}}{P_{t-1}}}$



If $\pi_t = \pi^*$, then the equilibrium is at point A.

If $\pi_t = \pi_L < \pi^*$, then the equilibrium is at point B.

A Downward Revision in Expectations.

"Mr. Draghi and his peers are afraid that consumers and investors will increasingly see low inflation as the new normal, creating a self-fulfilling prophecy." NYT, page B7, November 22, 2014.

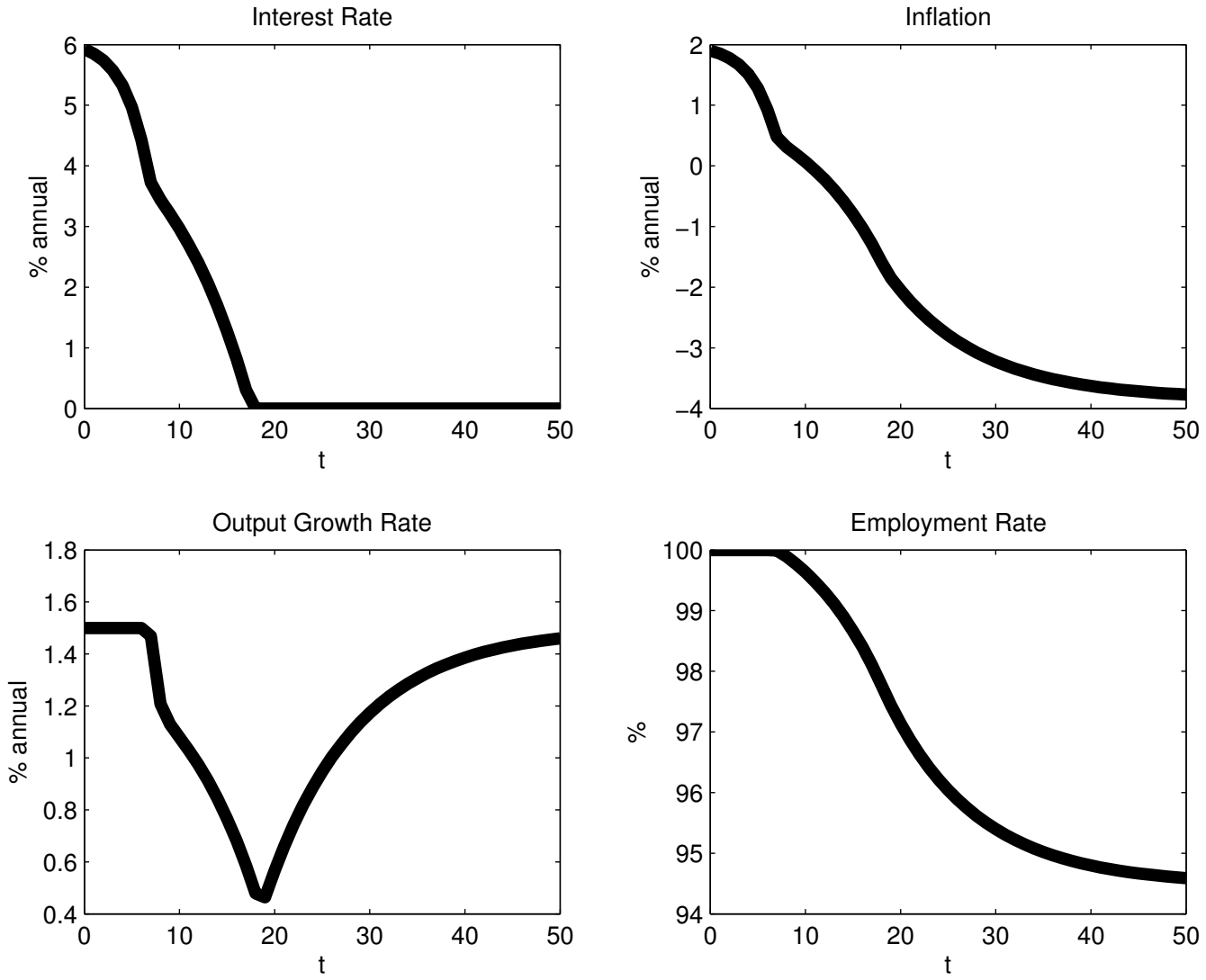
Assume that in period 0 expectations change from

$$\lim_{t\to\infty} \mathbb{E}_0 \pi_t = \pi^*$$

to

$$\lim_{t\to\infty} \mathbb{E}_0 \pi_t = \pi_L < \pi^*$$

Dynamics Triggered by a Downward Revision in Expectations



Source: Schmitt-Grohé and Uribe, 2017.

(b) How to lift the economy out of a confidence shock induced liquidity trap—the neo-Fisher effect

(Schmitt-Grohé and Uribe, 2010 and 2017)

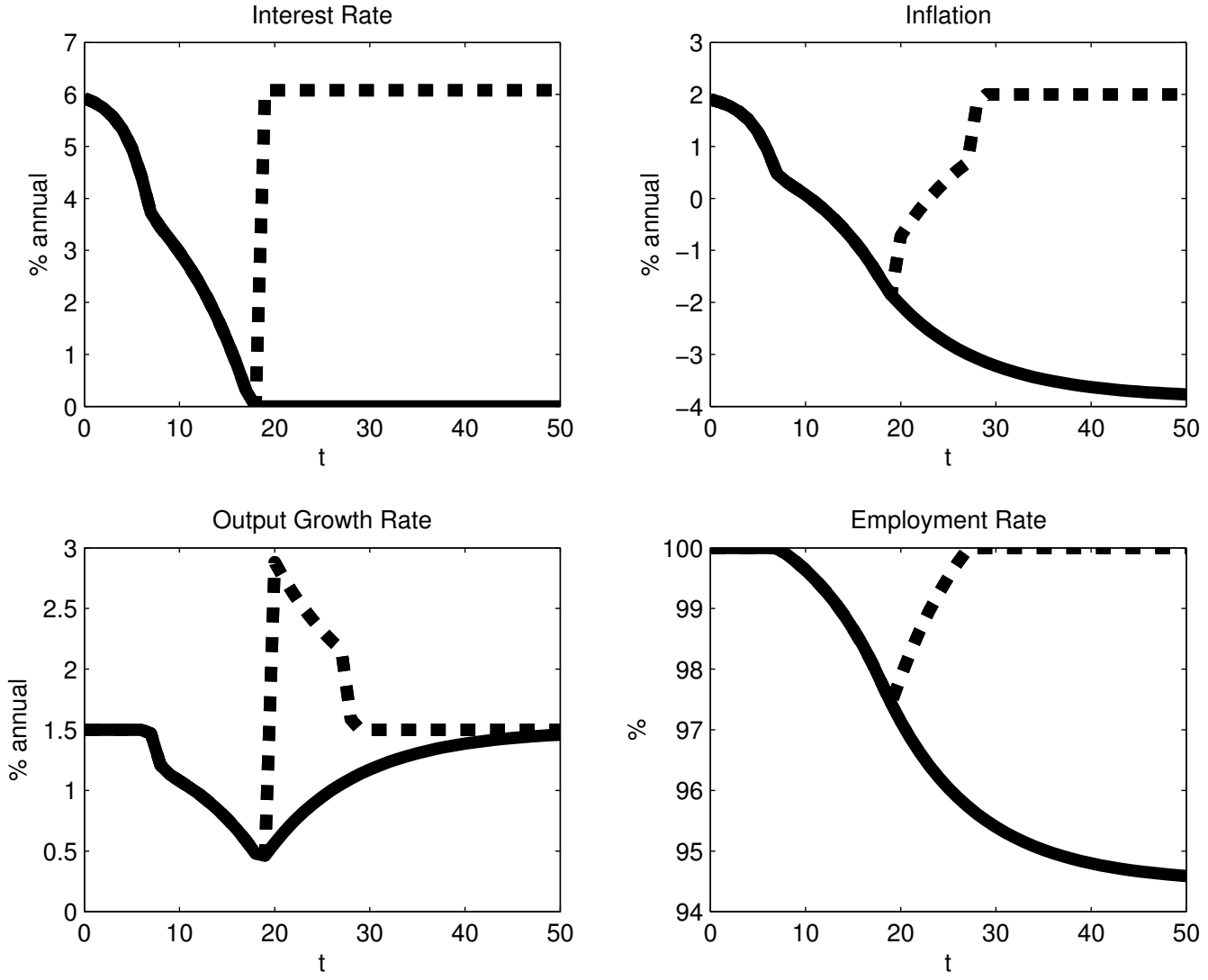
Consider the following interest rate policy:

$$R_t = \begin{cases} \max\left\{1, \frac{\pi^*}{\tilde{\beta}} + \alpha_\pi \left(\pi_t - \pi^*\right)\right\} & \text{if } s_t = 0 \\ R^* & \text{if } s_t = 1 \end{cases}.$$

$$s_t = \begin{cases} 1 & \text{if } R_j = 1 \text{ for any } 0 \leq j < t \\ 0 & \text{otherwise} \end{cases}.$$

In words, once the economy hits the zero lower bound the central bank raises the policy rate to the target level R^*

Exiting the Slump: Tightening is Easing



- Model predicts that when economy suffers a confidence shock then the economy falls into a liquidity trap and experiences a jobless growth recovery.

- In an environment with falling inflation expectations, an increase in nominal rates can contribute to re-anchoring expectations around the intended target and lifting the economy out of a slump **(the neo-Fisher effect)**.

- Possible objection to the proposed exit strategy: Tightening in the midst of a liquidity trap will only further exacerbate the slump.

(c) Empirical Evidene on the neo-Fisher Effect

What does the data say? Uribe (2017) estimates the neo-Fisher effect in the United States and Japan. His estimated model produces dynamics consistent with the neo-Fisherian prediction that a credible and gradual increase of nominal interest rates to normal levels can generate a quick reflation of the economy with low real interest rates and no output loss.

The Fisher effect vs the neo-Fisher effect.

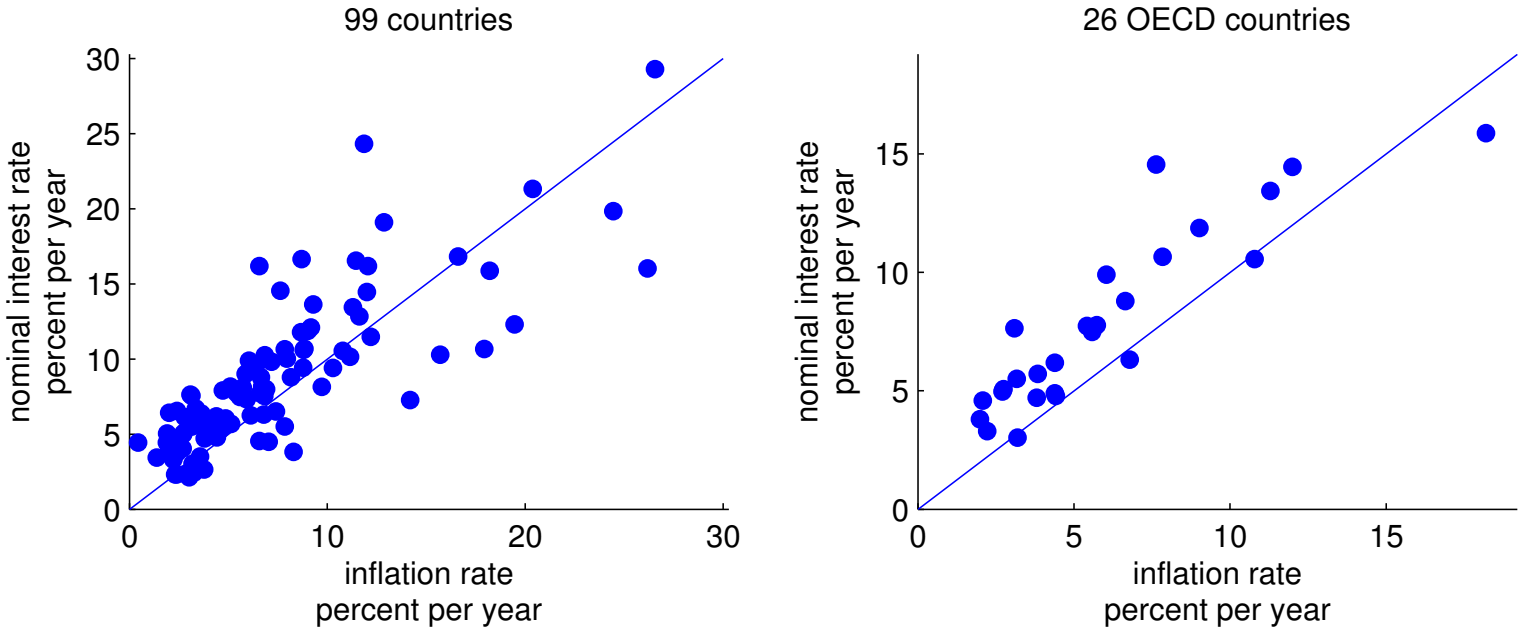
The Fisher effect (a long-run concept)

$$R = r + \pi$$

- $r =$ real interest rate
- The following two figures provide cross-sectional evidence consistent with the validity of the Fisher hypothesis in the long run.

Long-Run Average Inflation and Nominal Interest Rates: Cross-Country Evidence of the Fisher Effect

$$R = r + \pi$$



Source: Uribe, 2017. Each dot represents one country. The solid line is the 45-degree line. Average sample is 1989 to 2012.

The neo-Fisher Effect

What is the effect of a shock to the nominal rate on inflation?

Theory suggests that the answer depends on whether the change in the interest rate is expected to be transitory or permanent.

Effect of an Increase in the
Nominal Interest Rate on Inflation

	Long Run Effect	**Short** Run Effect
Transitory interest rate shock	0	$\downarrow$
Permanent interest rate shock	$\uparrow$	$\uparrow$

Entry (2,1): The Fisher effect.
Entry (2,2) : **The neo-Fisher effect.**

Uribe's (2017) Empirical Model

• The empirical model aims to capture the dynamics of three macro indicators:

• y_t, denoting the logarithm of real output per capita.

• π_t, denoting the inflation rate, expressed in percent per year.

and

• i_t, denoting the nominal interest rate, expressed in percent per year.

Four Shocks

X_t^m, denoting a permanent monetary shock.

z_t^m, denoting a transitory monetary shock.

X_t^n, denoting a permanent nonmonetary shock.

z_t^n, denoting a transitory nonmonetary shock.

Long-Run Identification Assumptions

• The nominal interest rate and inflation are cointegrated with the permanent monetary shock.

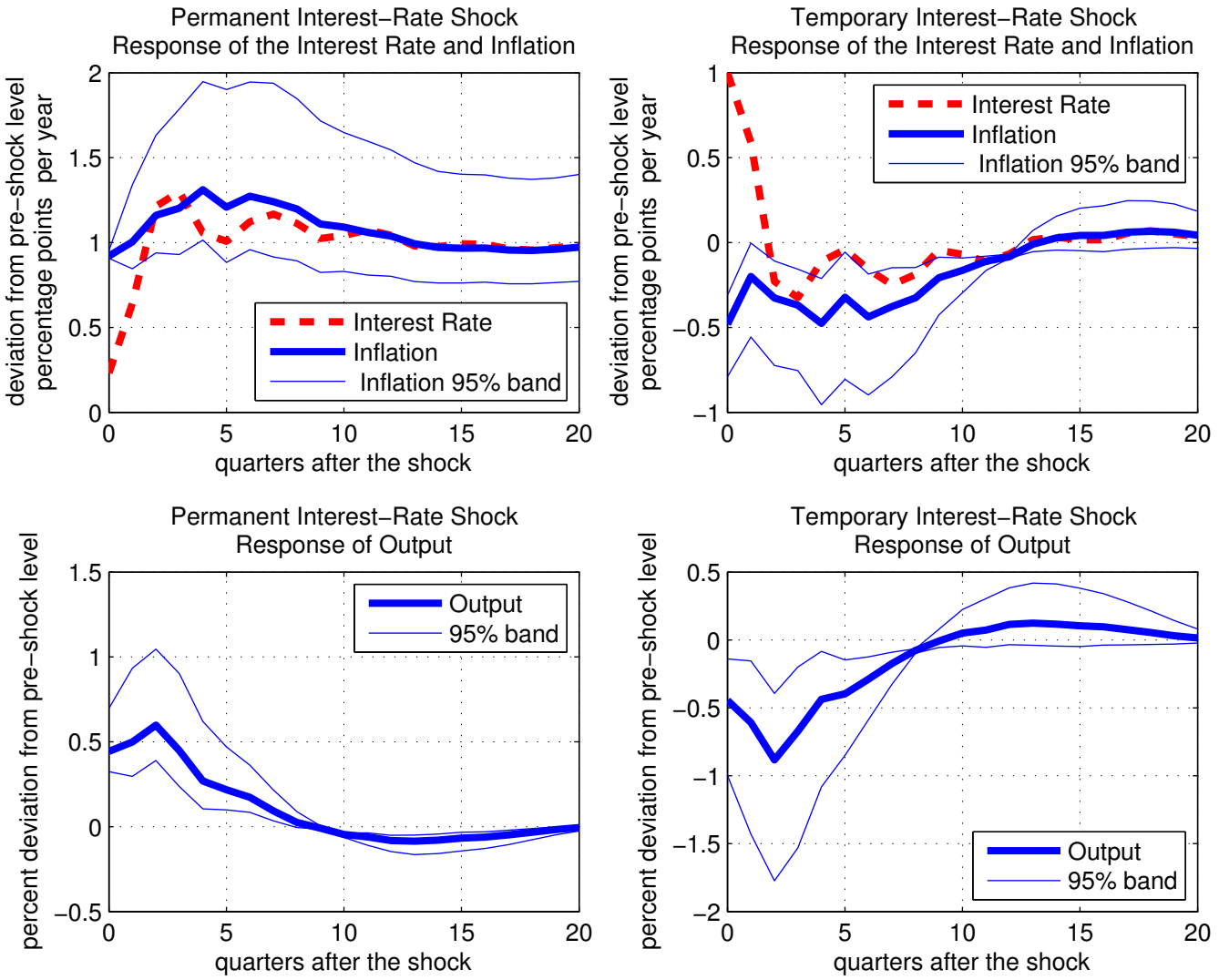
• Output is cointegrated with the permanent real shock.

Short-Run Identification Assumptions

• The transitory nominal-interest-rate shock ($z_t^m \uparrow$) has non-positive impact effects on inflation and output.

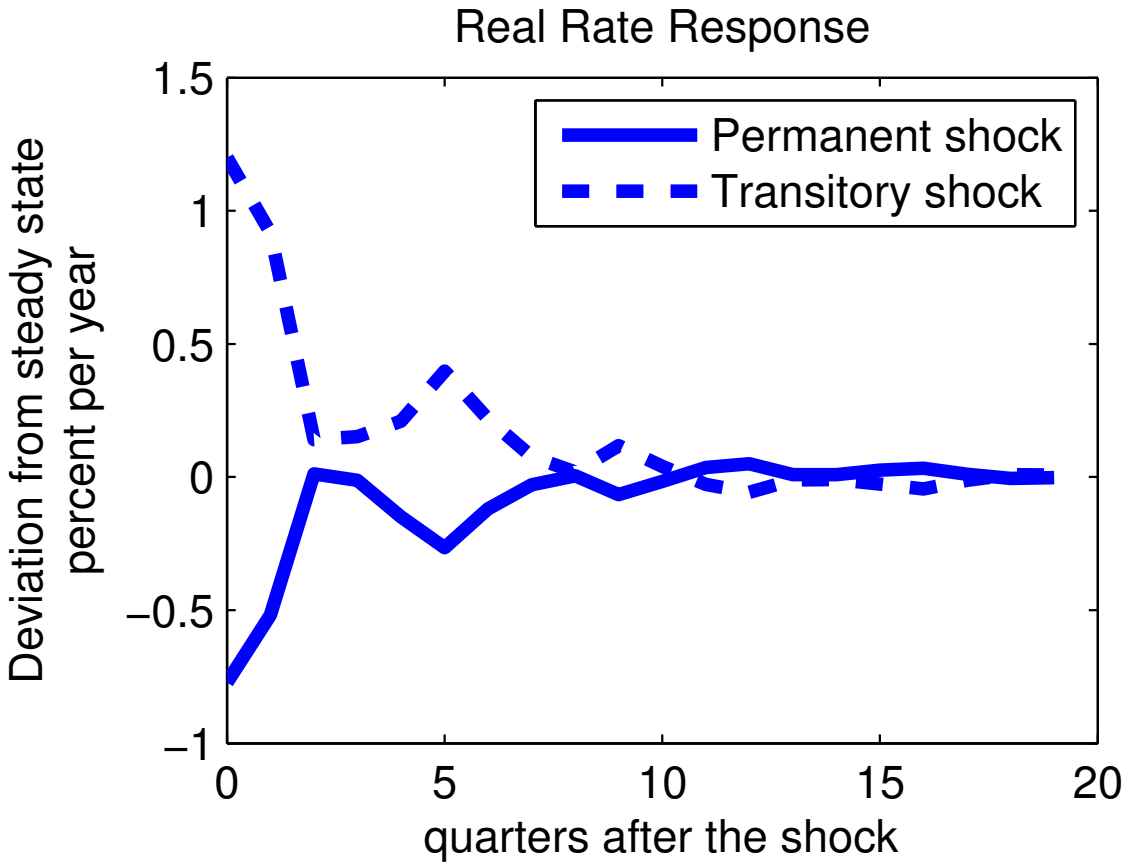
• The permanent nominal-interest-rate shock ($x_t^m \uparrow$) has a non-negative impact effect on the nominal interest rate itself. (Uribe also estimates the model without imposing this restriction and finds that the results are robust.)

Estimated Impulse Responses to Interest-Rate Shocks: United States



Source: Uribe, 2017.

Estimated Response of the Real Interest Rate to Permanent and Transitory Interest-Rate Shocks: United States



Source: Uribe, 2017. The real interest rate is defined as $R_t - E_t\pi_{t+1}$.

Observations on the Previous Two Figures

• By assumption/construction, in response to a permanent interest-rate shock both the nominal interest rate and inflation increase by 1 percent in the long run.

• The main result conveyed by the figure is that inflation reaches its long-run value in the short run.

• In fact, inflation adjusts faster than the nominal interest rate, so the real interest rate falls on impact and converges from below.

• The adjustment does not entail output loss.

• By contrast, the responses of nominal and real variables to a transitory increase in the nominal interest rate are conventional: The real interest rate increases on impact and converges from above, and output and inflation fall.

Summary of Lecture 2

- In the context of a model with downward nominal wage rigidity a negative shock to long-run inflation expectations can explain several of the observed characteristics of recoveries from recessions with liquidity traps: they are jobless and despite zero nominal rates inflation is below target.

- We suggest a novel strategy to reflate the economy by raising nominal rates — the neo Fisher effect.

- We presented empirical evidence based on (Uribe, 2017) showing that credible permanent increases in nominal rates do reflate the economy without raising real rates in the short run.