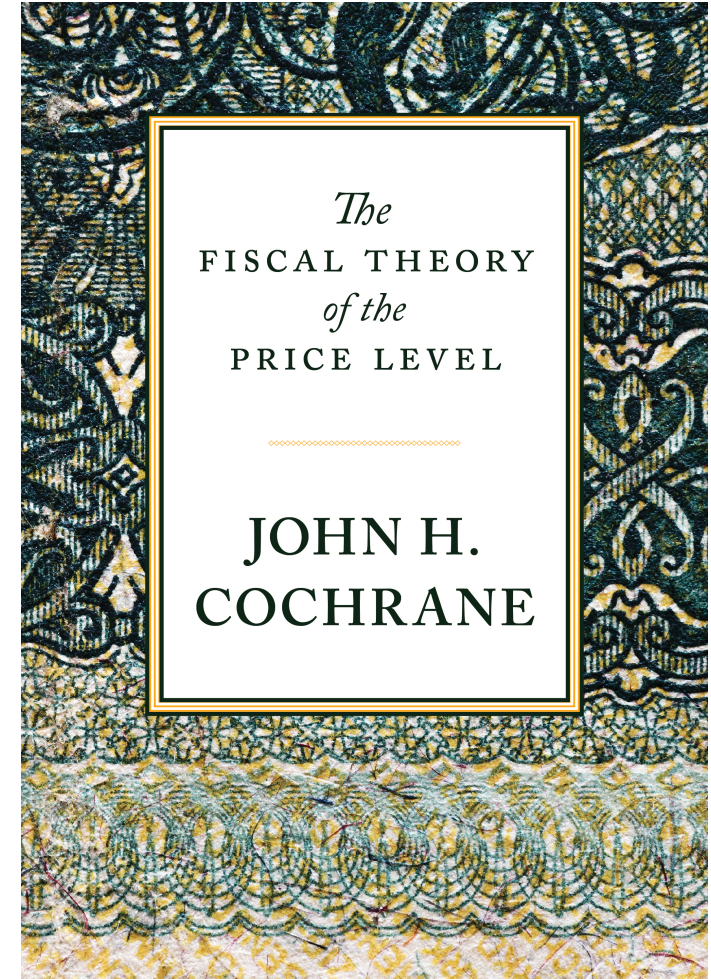


Fiscal theory, inflation, and monetary policy

John H. Cochrane
Hoover Institution

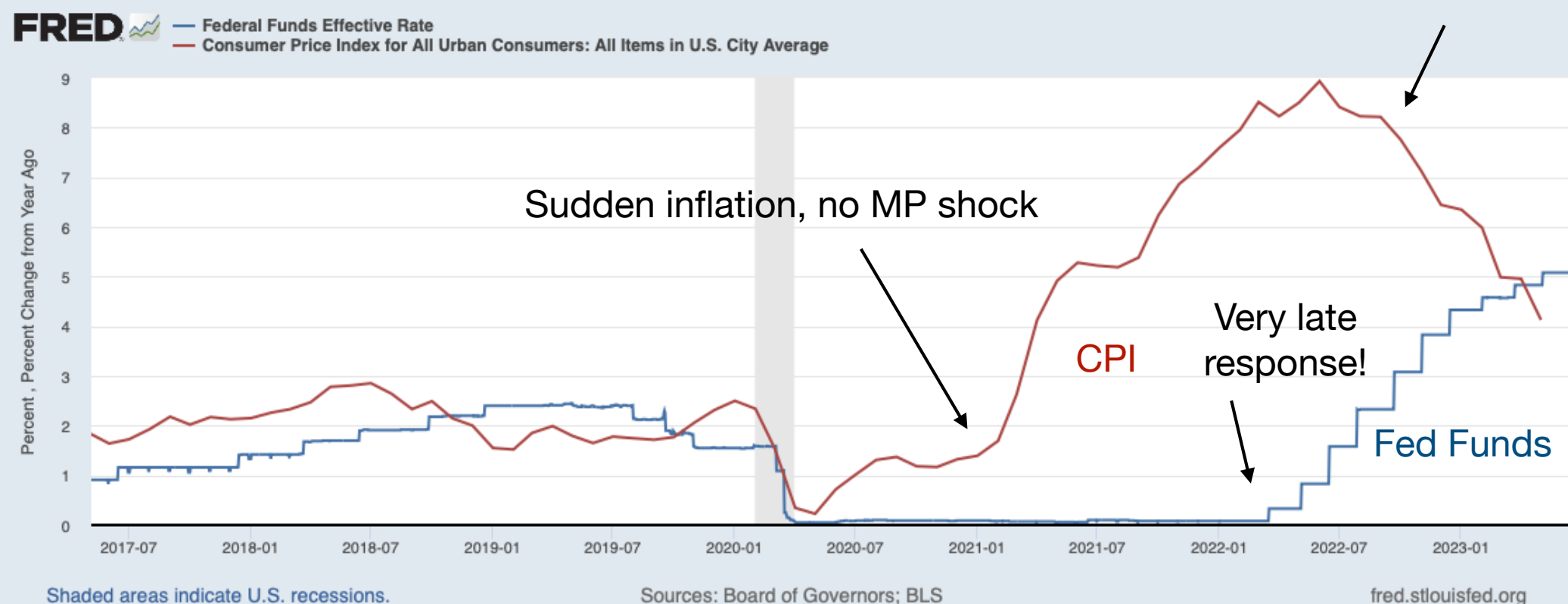
Ads

- *The Fiscal Theory of the Price Level*
- "Expectations and the Neutrality of Interest Rates"
- "Fiscal Histories"
- <https://www.johnhcochrane.com/>



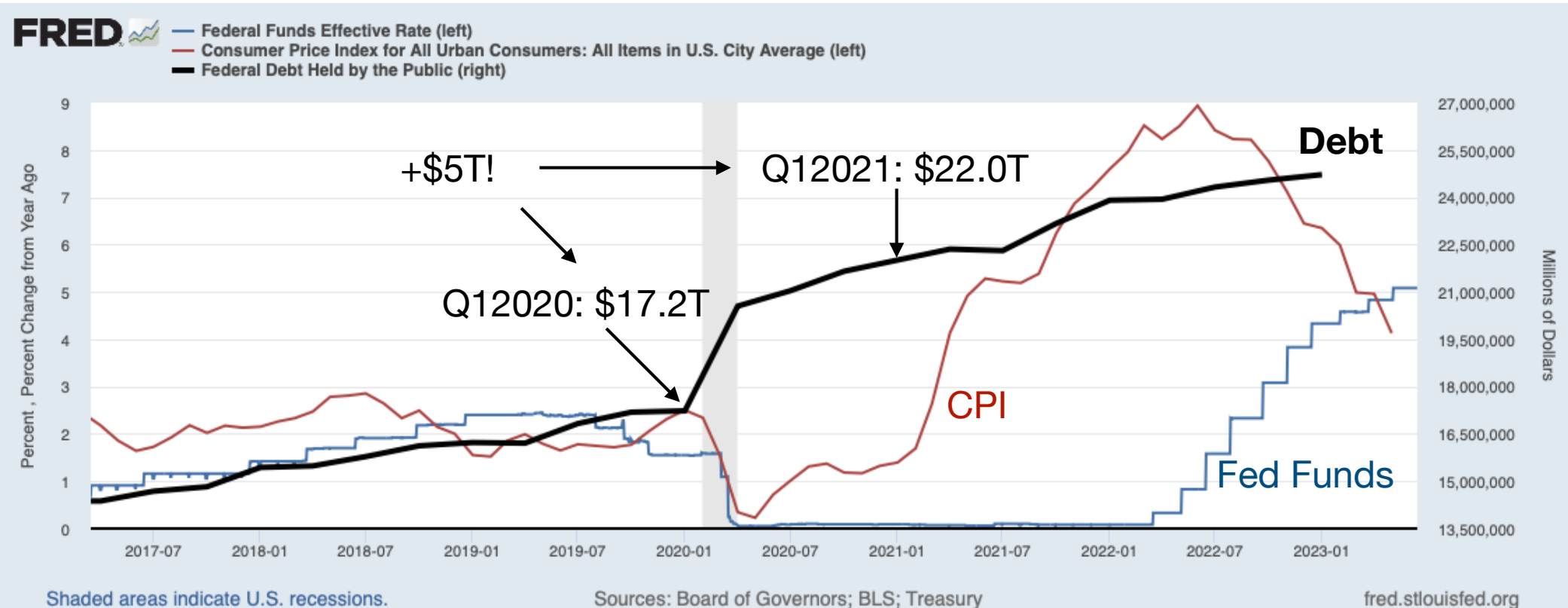
Inflation

Inflation eases, no 1980s $i > \pi$



- Why did inflation start?
 - Monetary policy?
 - Greed, monopoly, energy, supply chains? Those are *relative* prices.
- Why does inflation plateau and ease, not spiral, with $i < \pi$?

Inflation



Why did inflation break out?

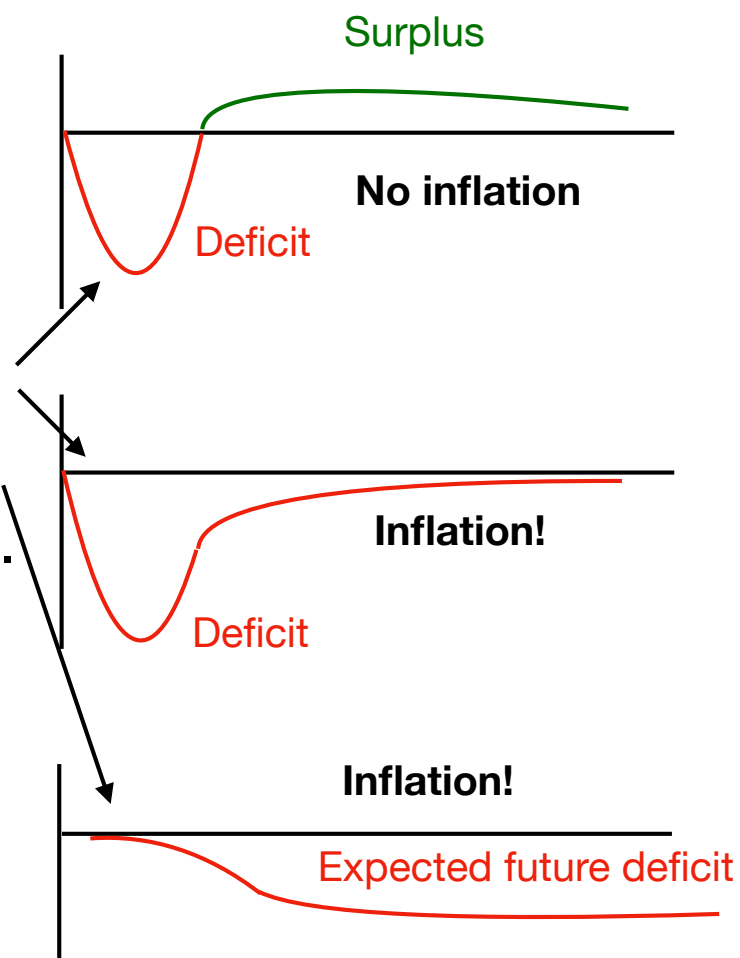
- +\$5T debt to public. (\$3T monetized). Checks to people, businesses.
- A fiscal helicopter drop!
- (M? Would \$5T QE with no deficit have had the same effect?)
- A job for fiscal theory of the price level!

Fiscal theory of the price level

$\frac{\text{Nominal government debt}}{\text{price level}} = \text{Present value of primary government surpluses}$

$$\frac{B_{t-1}}{P_t} = E_t \sum_{j=0}^{\infty} \frac{\Lambda_{t+j}}{\Lambda_t} s_{t+j}$$

- Debt vs. *long run* ability/will to repay. S soaks up money. Like stocks.
- Not necessarily *today's* deficits or debt. “Stock” vs. Keynesian “flow.”
- Lots of debt/deficit possible with no inflation. Or, inflation can be a surprise with little deficit.
- Higher discount rate / interest costs = more inflation. Empirically important.
- “Nominal anchor;” foundation for more complex dynamics. Sticky prices, DSGE.
- No price level jump? Sticky prices....



Fiscal theory with new-Keynesian price stickiness

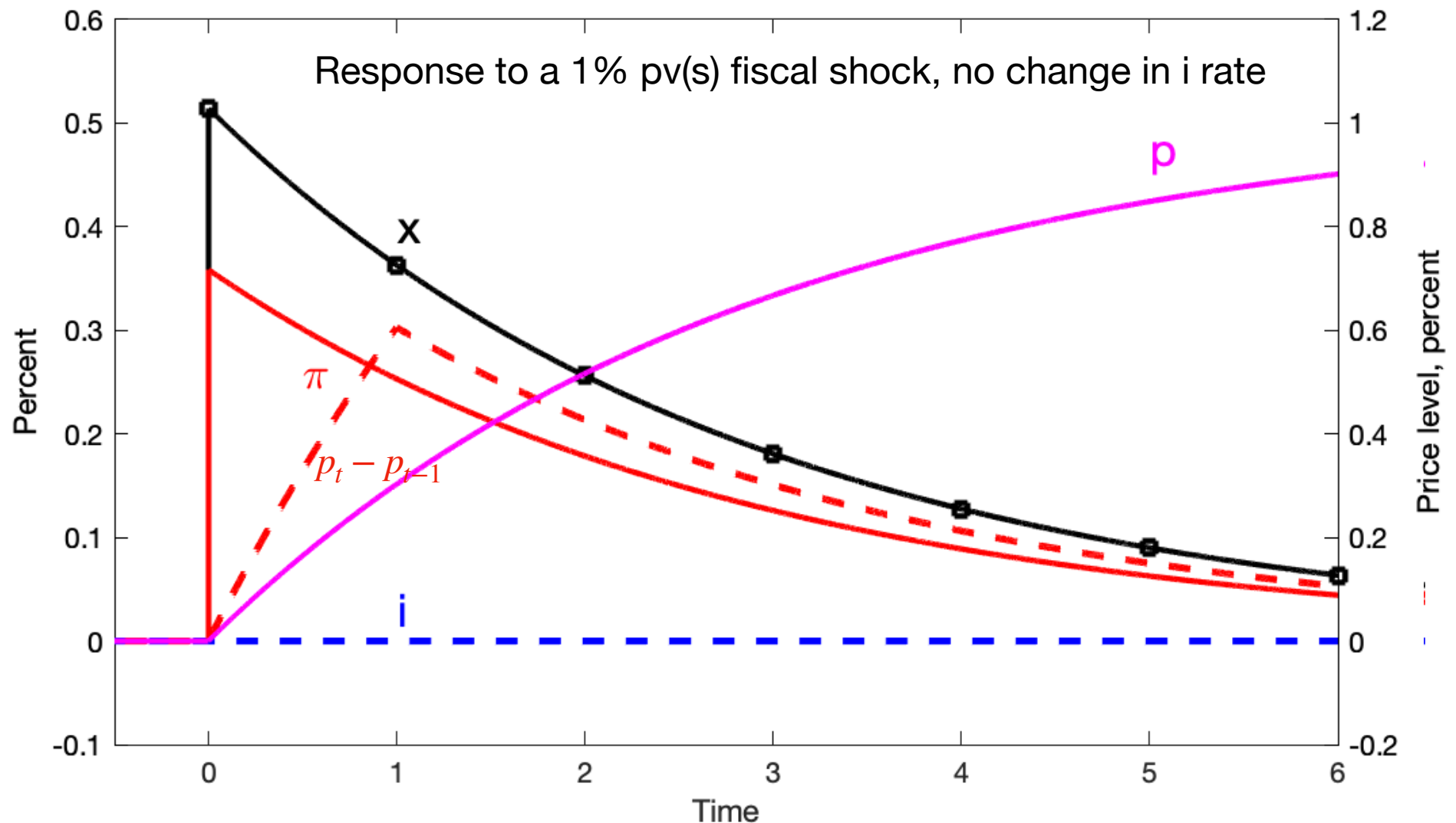
$$x_t = E_t x_{t+1} - \sigma(i_t - E_t \pi_{t+1})$$

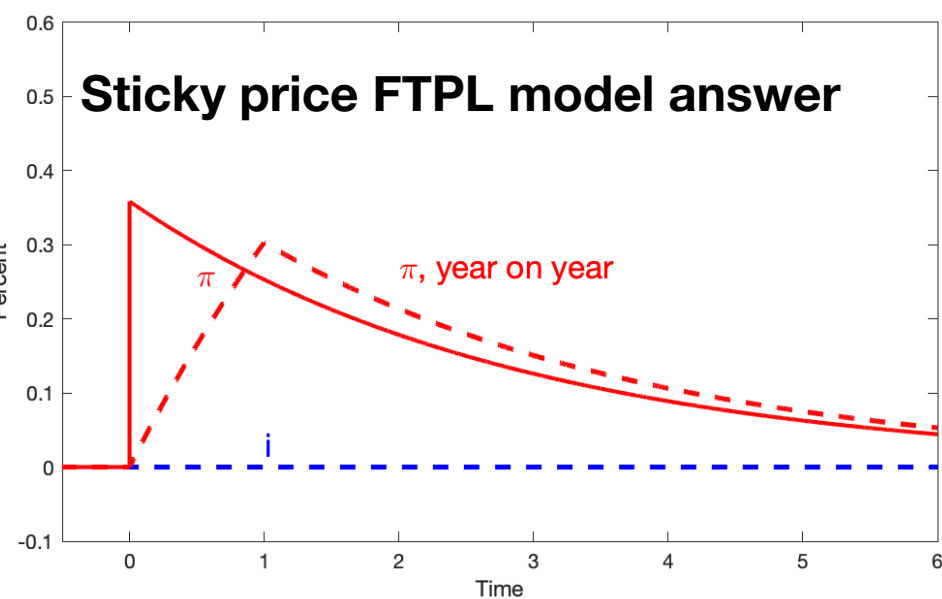
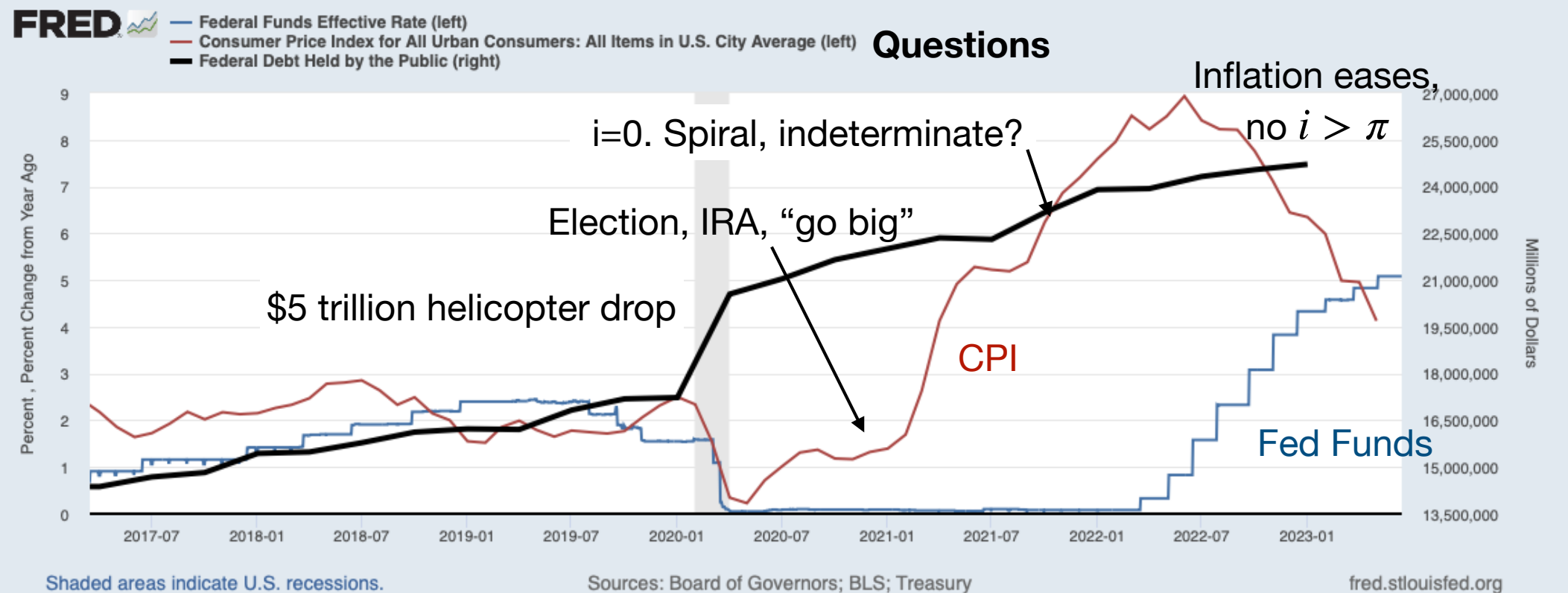
$$\pi_t = \beta E_t \pi_{t+1} + \kappa x_t$$

$$\rho v_{t+1} = v_t + i_t - \pi_{t+1} - \tilde{s}_{t+1}$$

$$0 = E_t \lim_{T \rightarrow \infty} \rho^T v_t$$

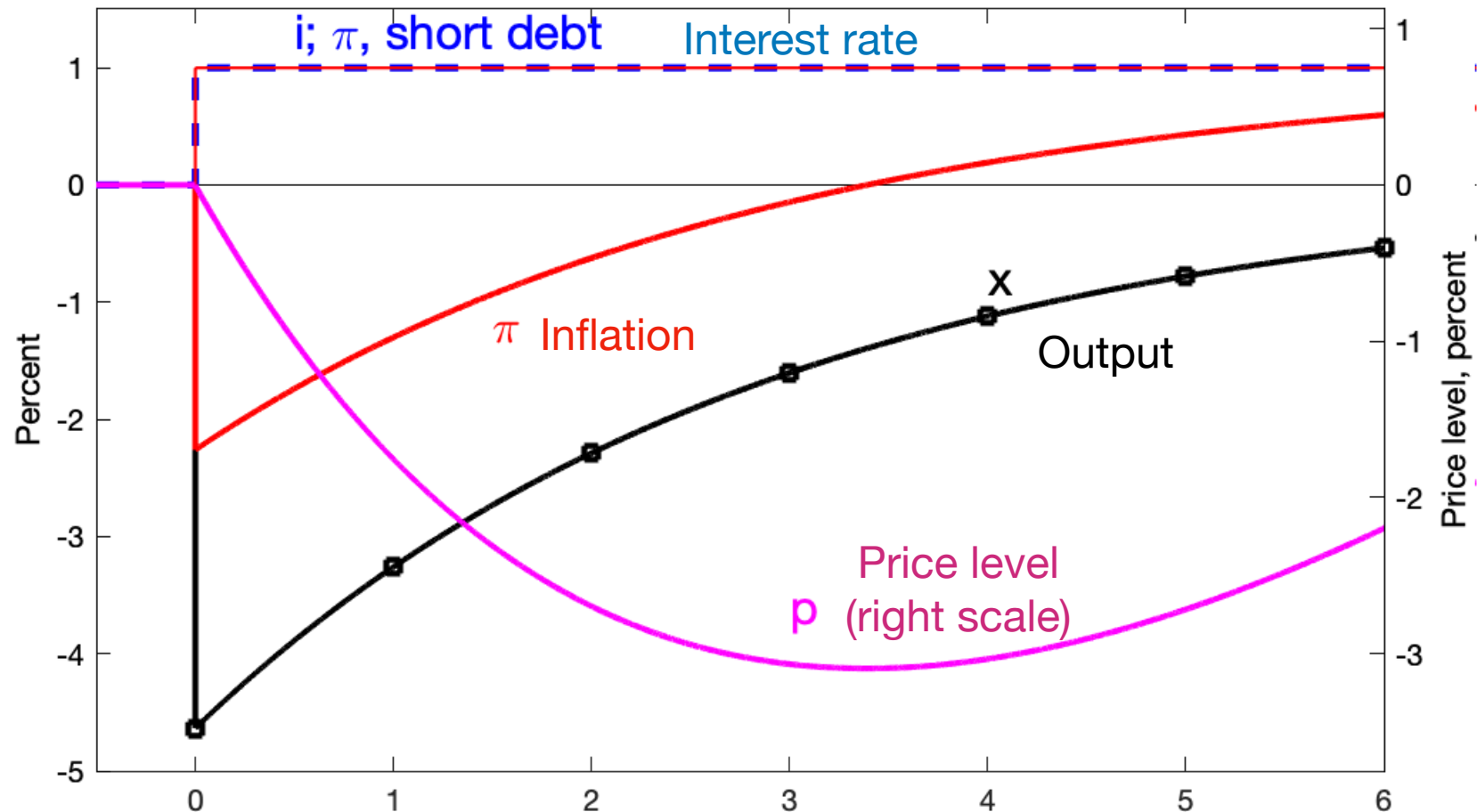
- No price level jump. Slowly inflate away debt. ($\pi > i$.)
- Inflation eventually goes away even with no i response.
- Very simple case! Much more generality is possible, including i rules, endogenous s , complex NK/DSGE etc.





- Model accounts for rise & easing of inflation, cumulative magnitude, and no spiral/sunspots.
- Why now & vs. 2008?
 1. Bigger, and no demand recession?
 2. Promises: “stimulus now, repayment later” vs. suspend payfor rules, $r < g$, MMT?
 3. Surprise -1% interest cost/discount rate 2008-2021. Not again!
 4. Cash vs. bonds and who gets it?
- Why did people not save extra reserves&debt?
- Timing? Multiple shocks. Inflation when $E(s)$ changes. IRA, “Go big”?

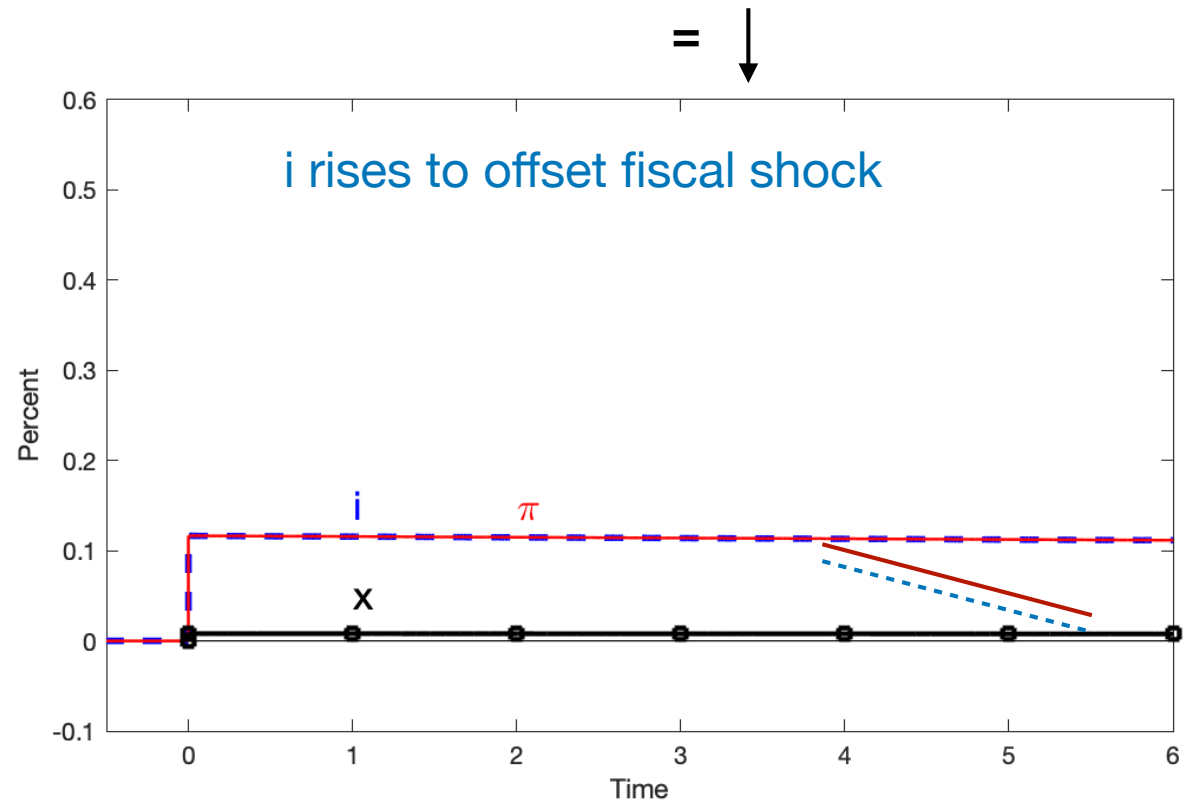
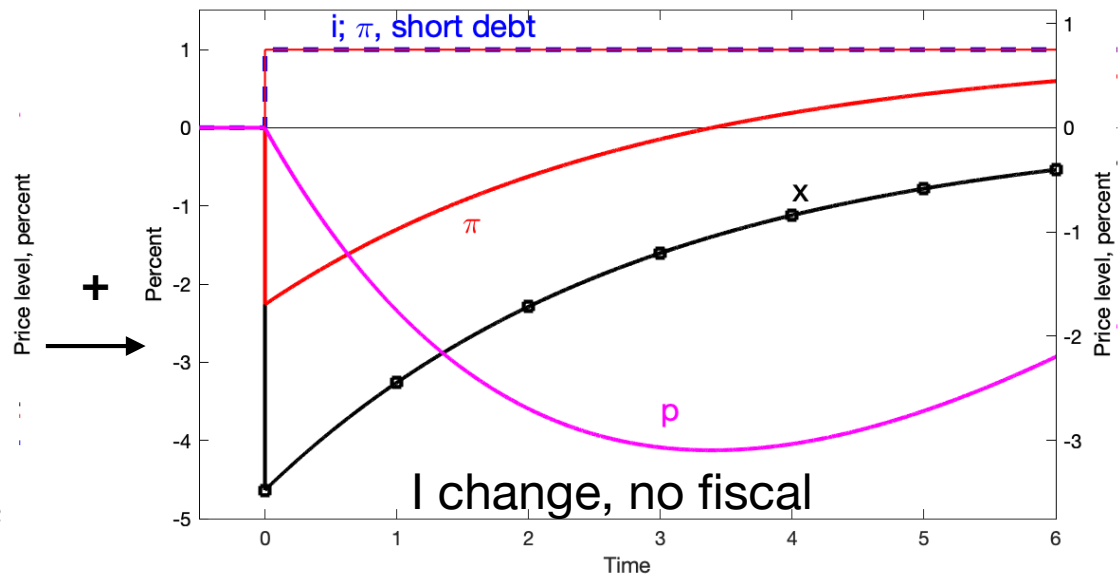
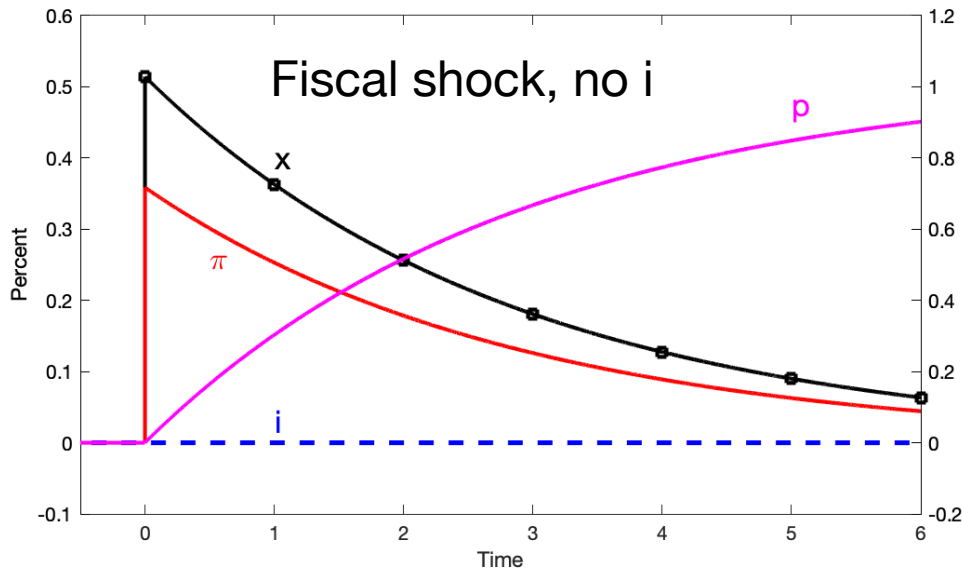
What about monetary policy?



Response to a 1% interest rate rise, with *no change in fiscal surpluses*.

- NK + FTPL model, with long-term debt.
- Higher interest rates *raise long run* inflation. $i_t = r_t + E_t \pi_{t+1}$, stable.
- *Short-run negative sign* from long-term bond effect.
- Unpleasant interest-rate arithmetic.
- *Not* standard Keynesian intuition (higher rates lower demand, Phillips curve).
- (Permanent rate rise is just illustrative. Same effect for transitory rise.)

Central banks offset fiscal shock; Taylor rule



- Central bank can smooth the inevitable inflation, which reduces output effects.
- Policy rule $i_t = \theta \pi_t$ works automatically.
- Good! But persistent inflation.
- And very limited central bank power. *Can't we do better?*

A more effective monetary policy?

- Missing: Central banks lower inflation with high real interest rates.
- Question: Can higher interest rates lower inflation?
- Fact: All conventional models in which higher interest rates lower inflation include a contemporaneous fiscal tightening. *Higher interest rates without fiscal tightening do not lower inflation.*
- Examples:
 1. 1% real rate rise = 1% more interest cost = 1% of GDP deficit.
 2. Higher rates → recession → stabilizers, stimulus, bailout.
 3. Lower inflation = windfall to bondholders.
- Models: Fiscal policy (immediately or eventually, i.e. to pay off debt) tightens to pay these costs, and more.
- What can monetary policy do *without fiscal tightening*?
- Theory: To understand “monetary policy,” what can central banks do by themselves, what is really monetary policy?
- Policy: Today, monetary policy may not be able to count on fiscal tightening.

Standard new-Keynesian model

$$x_t = E_t x_{t+1} - \sigma(i_t - E_t \pi_{t+1})$$

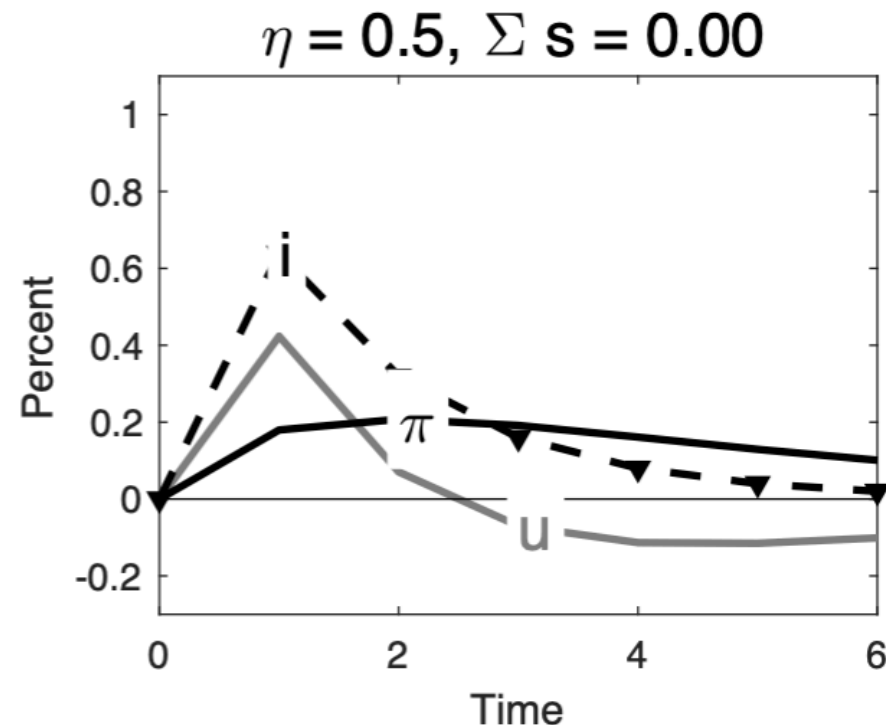
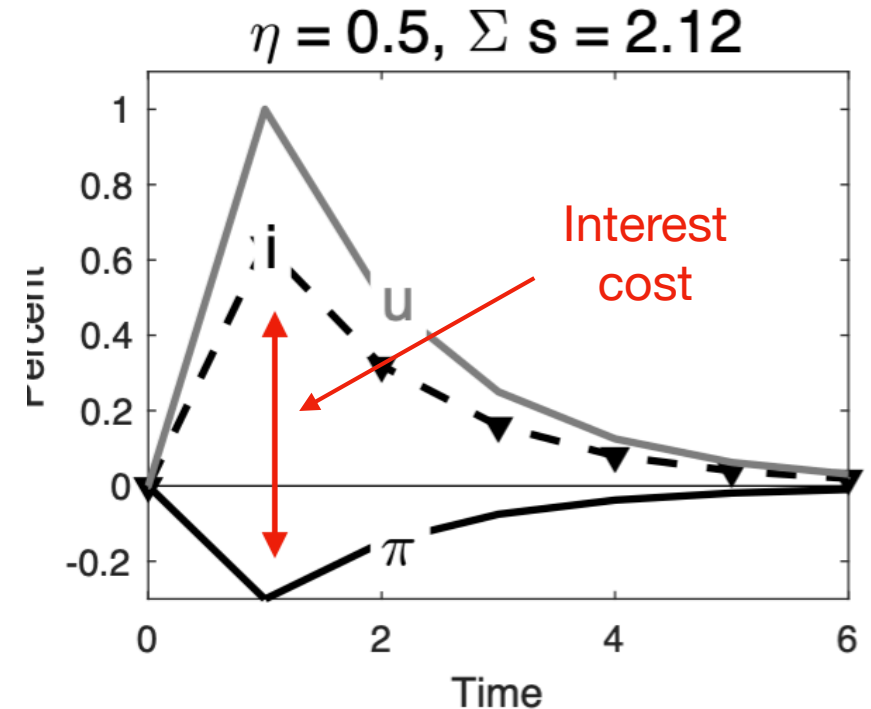
$$\pi_t = \beta E_t \pi_{t+1} + \kappa x_t$$

$$i_t = \phi \pi_t + u_t; \quad \phi > 1$$

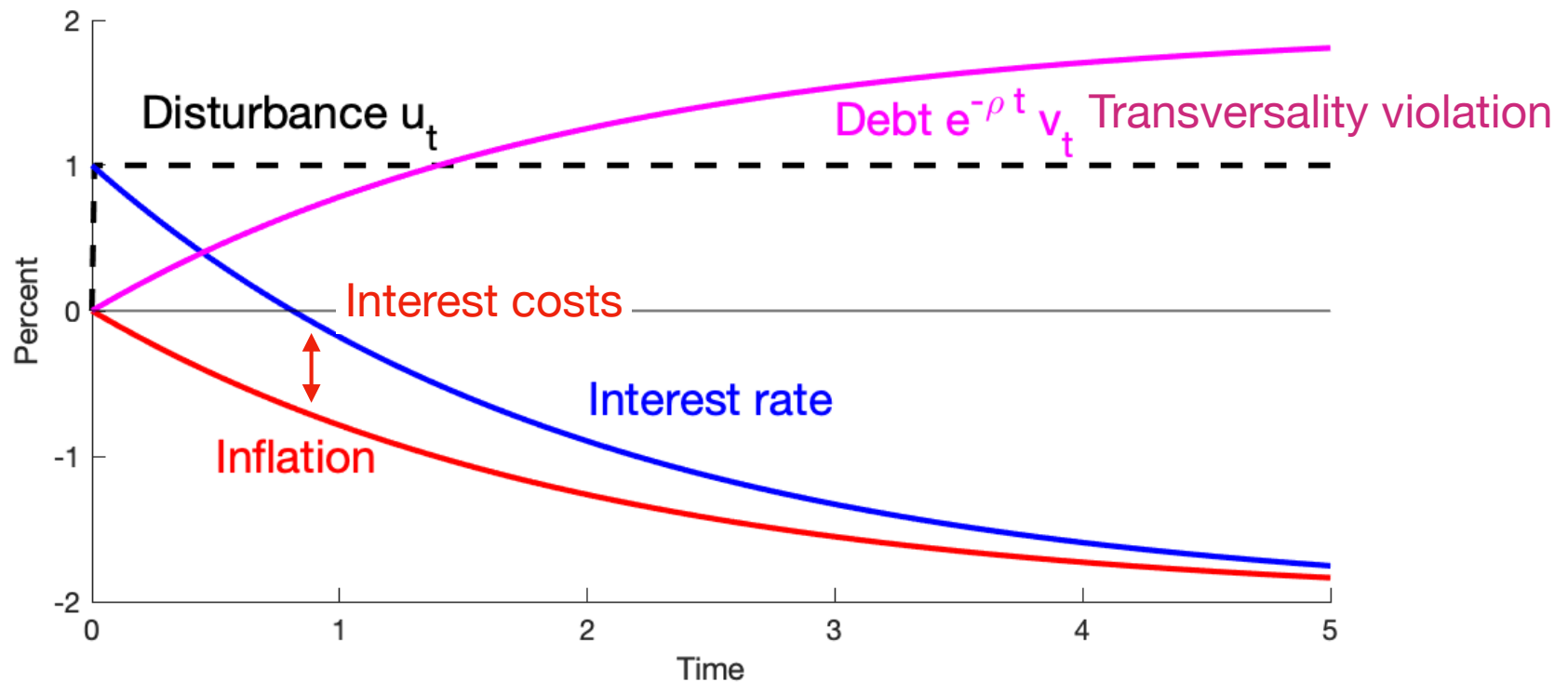
$$u_{t+1} = \eta u_t + \varepsilon_{t+1}$$

$$\rho v_{t+1} = v_t + i_t - \pi_{t+1} - \tilde{s}_{t+1}$$

- NK model with a transitory AR(1) shock lowers inflation.
- But “passive” fiscal raises taxes to pay interest cost & bondholder windfall.
- Choose $\{u\}$ (not AR(1)) to produce the *same* i path, no fiscal tightening: *Inflation rises!*
- (Roughly, $i_t - \pi_{t+1}$ averages zero).
- General: Higher interest rates without fiscal tightening *raises* inflation in NK model.
- NK inflation reduction is fiscal, not monetary.



Fiscal foundations in adaptive expectations /old Keynesian.



- Disinflation requires fiscal tightening to pay interest costs on debt.
- “Expectations and neutrality”: Interest rates with no change in fiscal policy *cannot* change long-run inflation.
- Intuition: present value of change in real interest cost on debt = 0 implies average real interest to move inflation = 0.

$$x_t = -\sigma(i_t - \pi_{t-1})$$

$$\pi_t = \pi_{t-1} + \kappa x_t$$

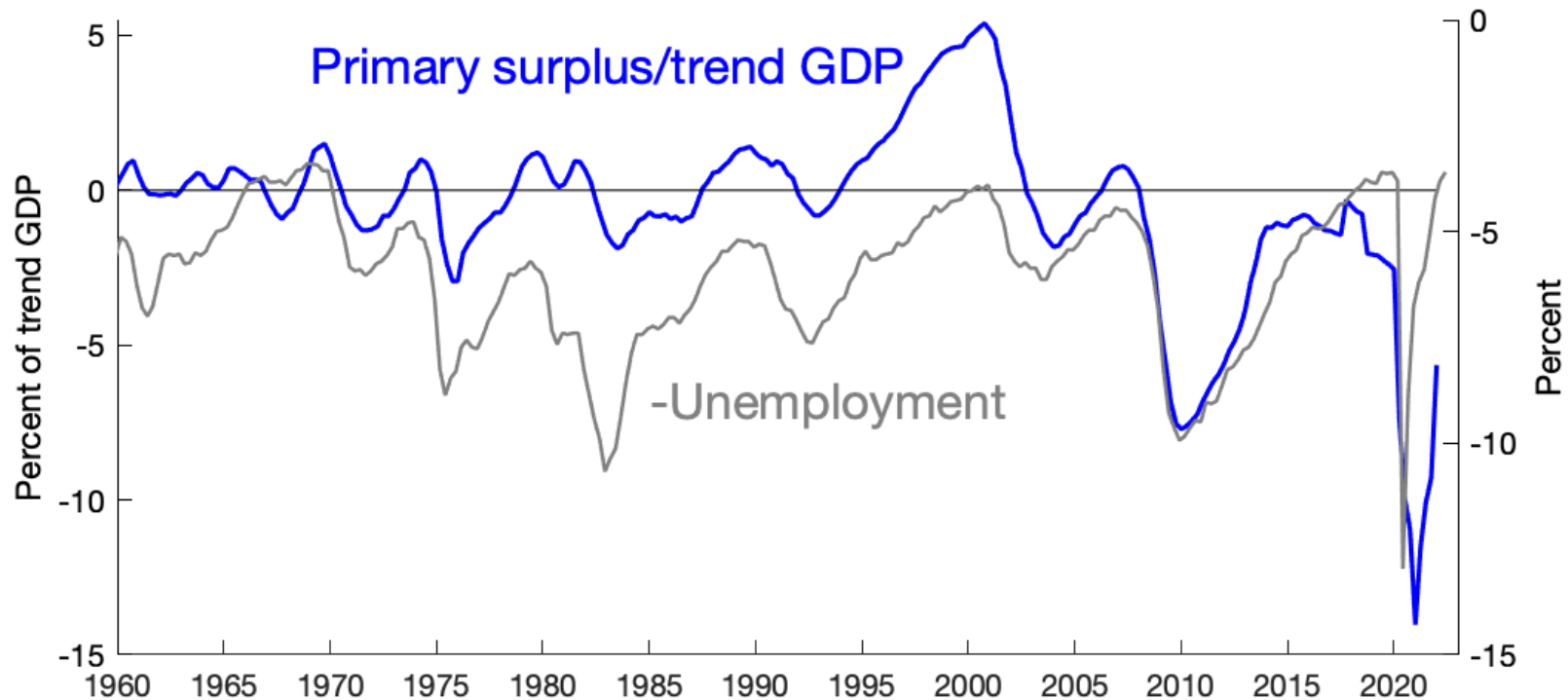
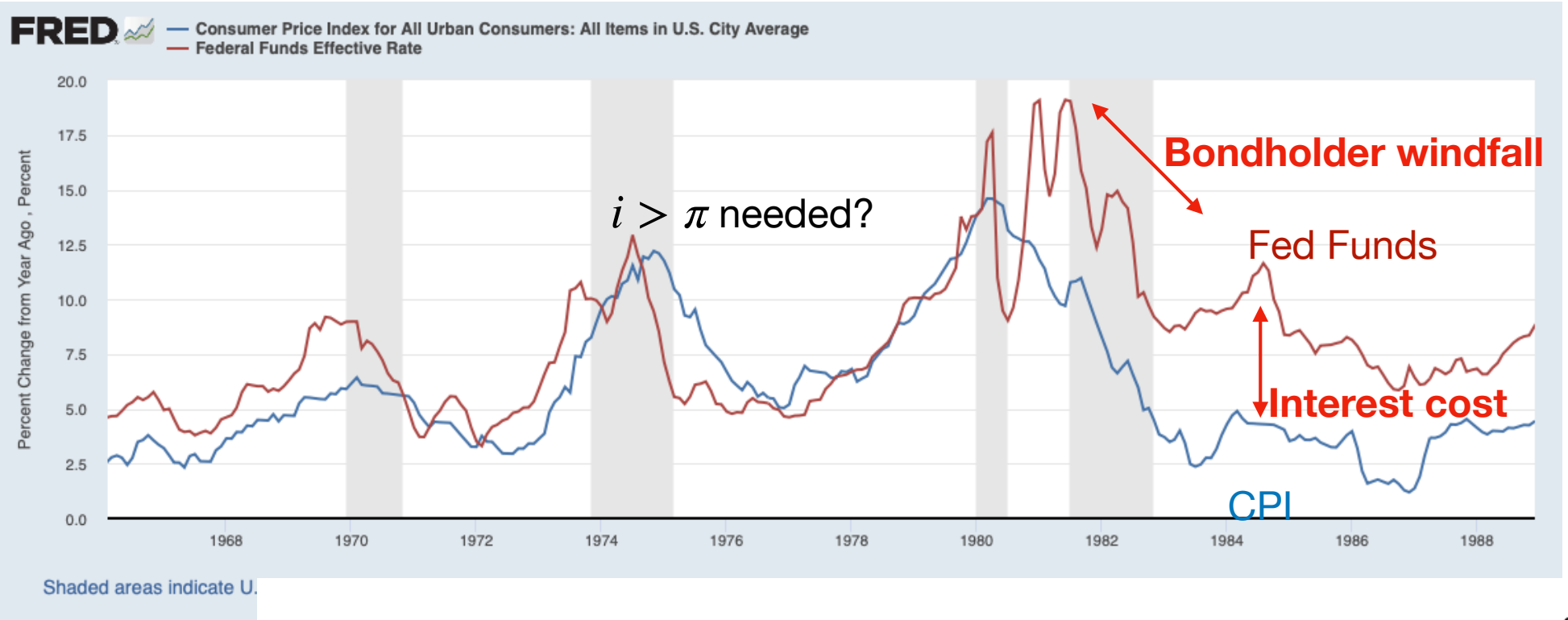
$$\rho v_{t+1} = v_t + i_t - \pi_{t+1}$$

$$i_t = \phi \pi_t + u_t$$

$$\sigma \kappa = 1; \phi = 1.5 \rho = 0.99$$

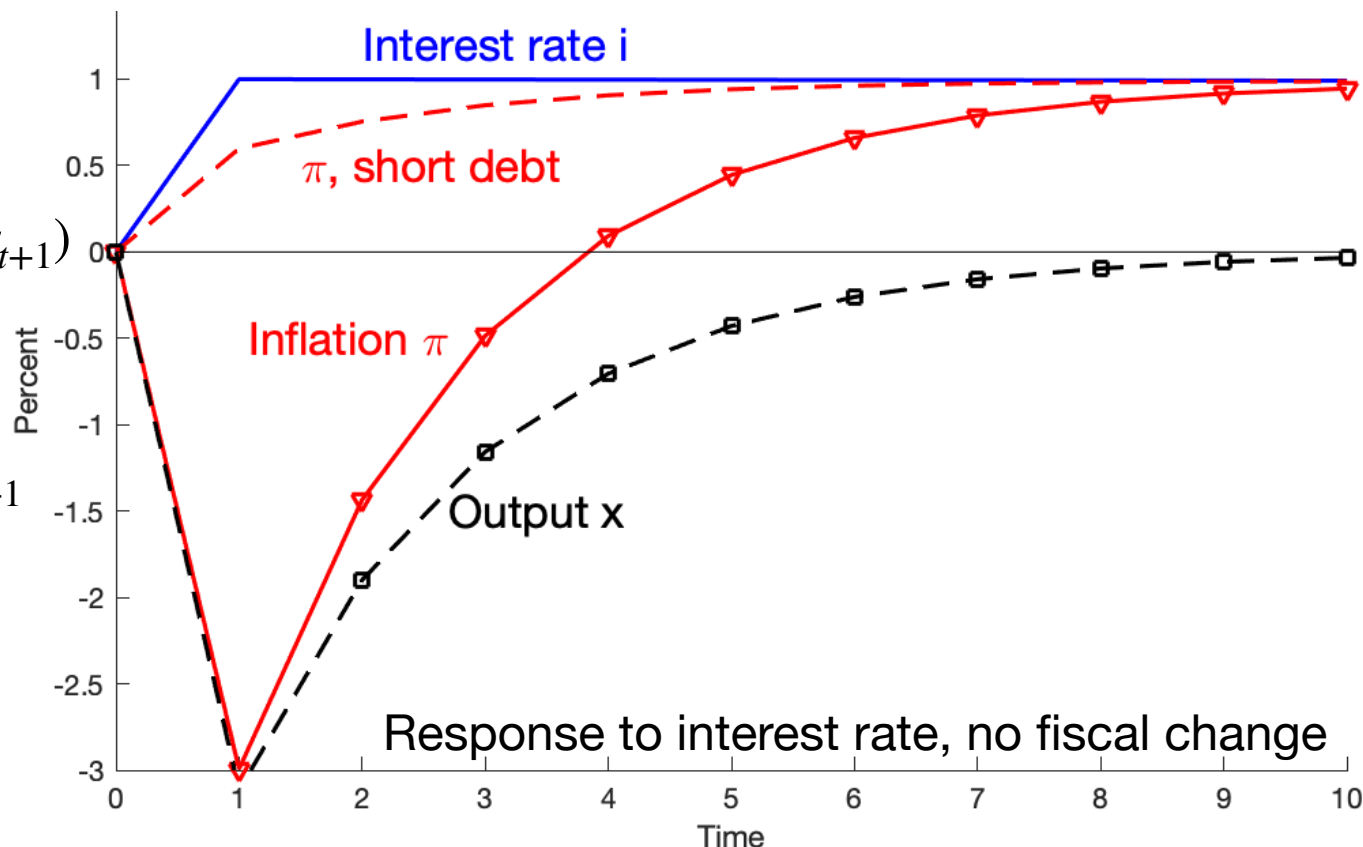
(Continuous time)

1980s were a joint monetary, fiscal, and microeconomic disinflation



The imperfect best we have

$$\begin{aligned}
 x_t &= E_t x_{t+1} - 0.5(i_t - E_t \pi_{t+1}) \\
 \pi_t &= E_t \pi_{t+1} + 0.5x_t \\
 i_t &= i_{t-1} + \varepsilon_{i,t} \\
 \rho v_{t+1} &= v_t + r_{t+1}^n - \pi_{t+1} - \tilde{s}_{t+1} \\
 E_t r_{t+1}^n &= i_t \\
 r_{t+1}^n &= 0.9q_{t+1} - q_t.
 \end{aligned}$$

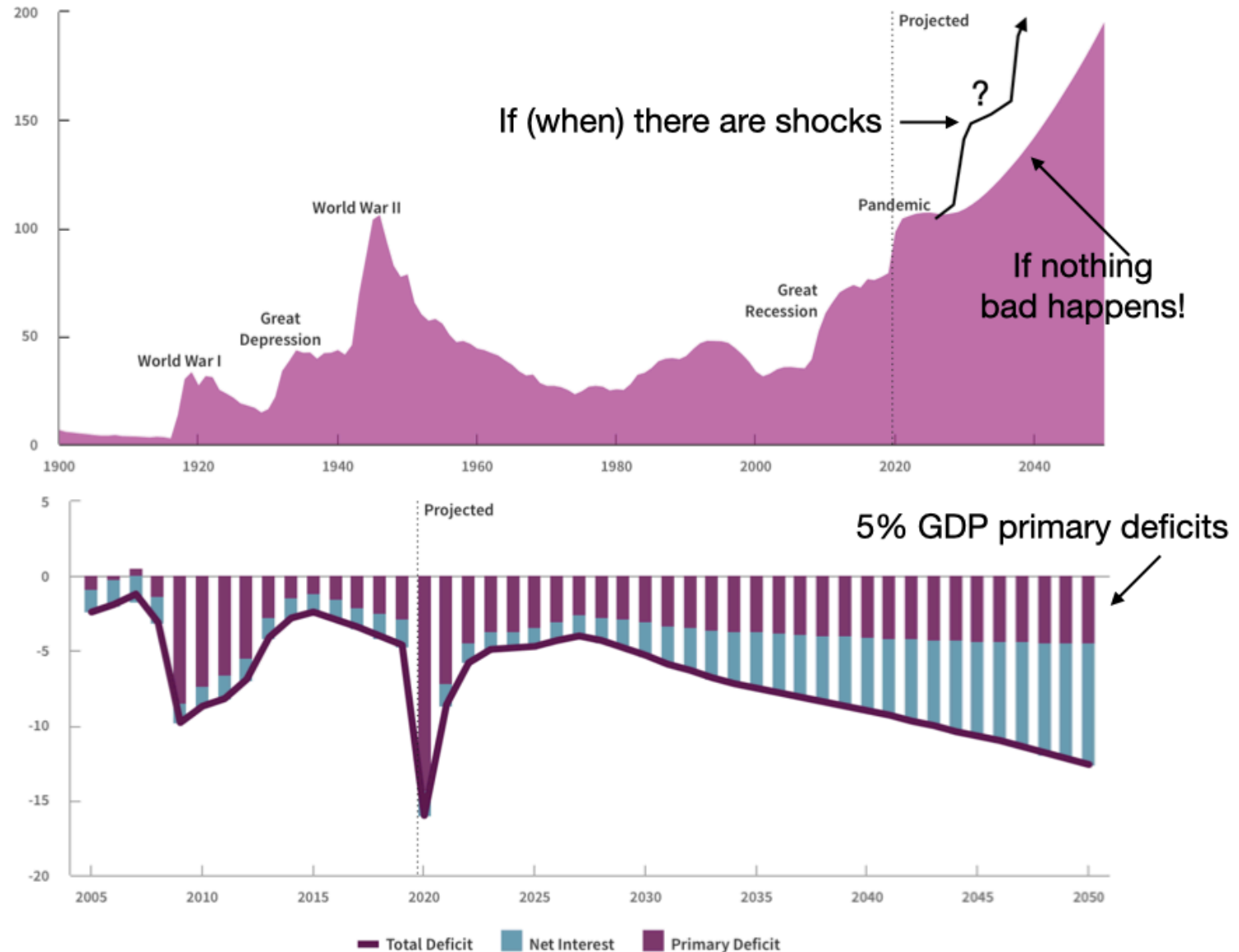


- Only “unpleasant arithmetic,” move inflation around; Only unexpected rate rises; Only with long term debt, weaker for short debt. More for longer-lasting rate rises, weaker for transitory rises. *Less* for more sticky prices.
- Works by reallocating wealth among bond holders. Not Sticky prices, raise real rates, lower AD, Phillips curve. On central bank websites / speeches
- Urgently needed: A better model in which higher rates lower inflation. Empirical work for how rates without fiscal help affect inflation.
- Or, maybe this is the best there is!

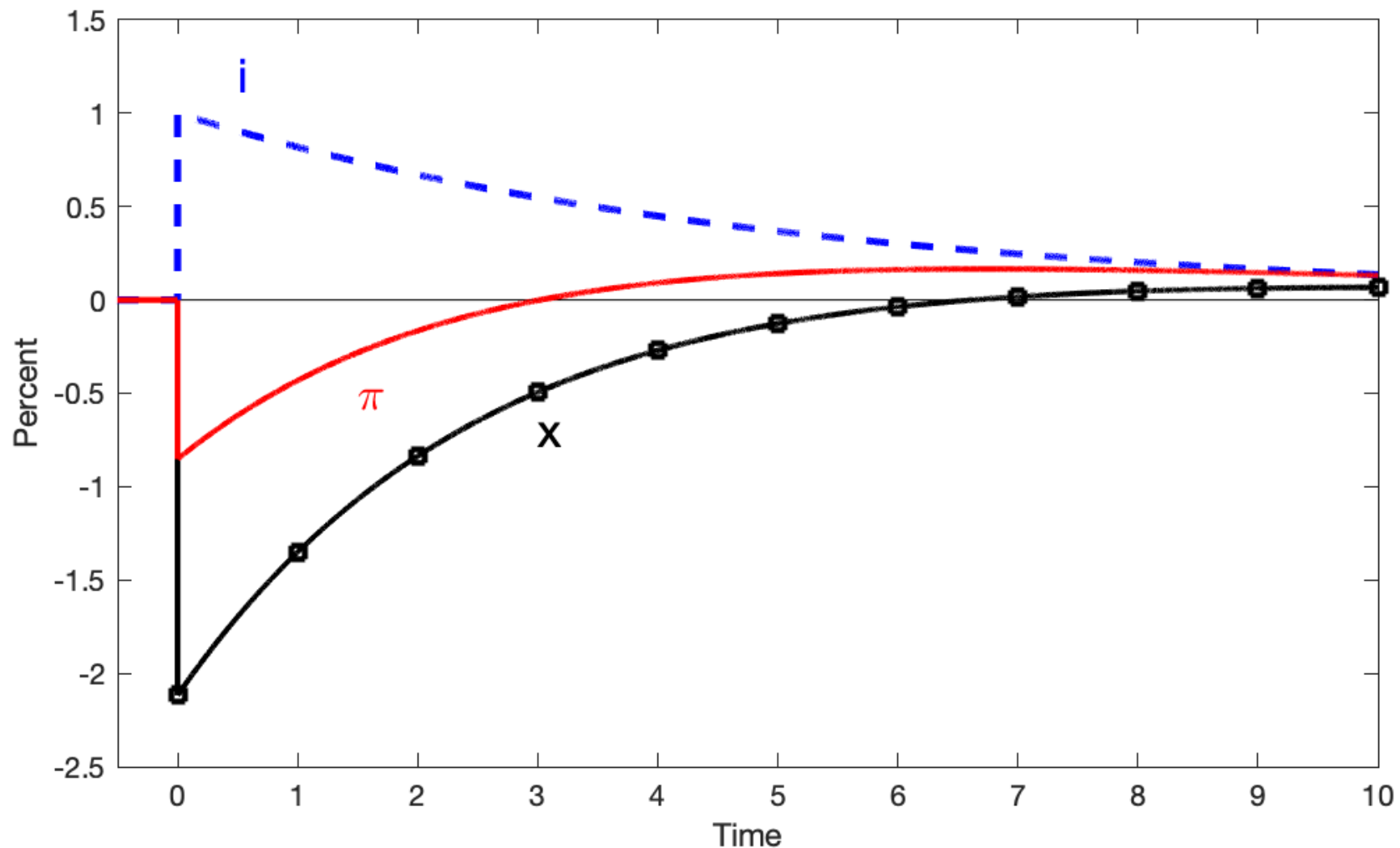
The future

- CBO: Projection, not expectation. Evidently, people don't think this will happen.
- Danger 1: People lose faith that it will get fixed.
- Danger 2: Next big shock?

Federal Debt Held by the Public, 1900 to 2050
Percentage of Gross Domestic Product



Monetary policy shock.



- Permanent inflation/rate rise is not necessary. Just shows long run effect better.
- Central Bank sets long run expected inflation $i_t = E_t \pi_{t+1}$, but with positive sign.

Theory of inflation under interest rate targets (much simplified)

Model $x_t = E_t x_{t+1} - \sigma(i_t - \pi_t^e)$

$$\pi_t = \pi_t^e + \kappa x_t$$

Inflation dynamics $\pi_t = (1 + \sigma\kappa)\pi_t^e - \sigma\kappa i_t.$

1) Adaptive Expectations

$$\pi_t^e = \pi_{t-1} \rightarrow \pi_t = (1 + \sigma\kappa)\pi_{t-1} - \sigma\kappa i_t.$$

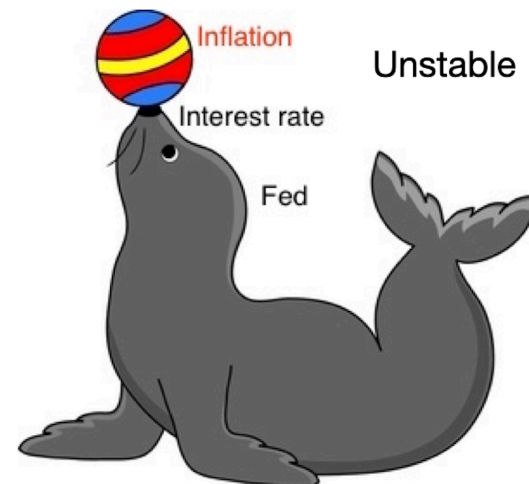
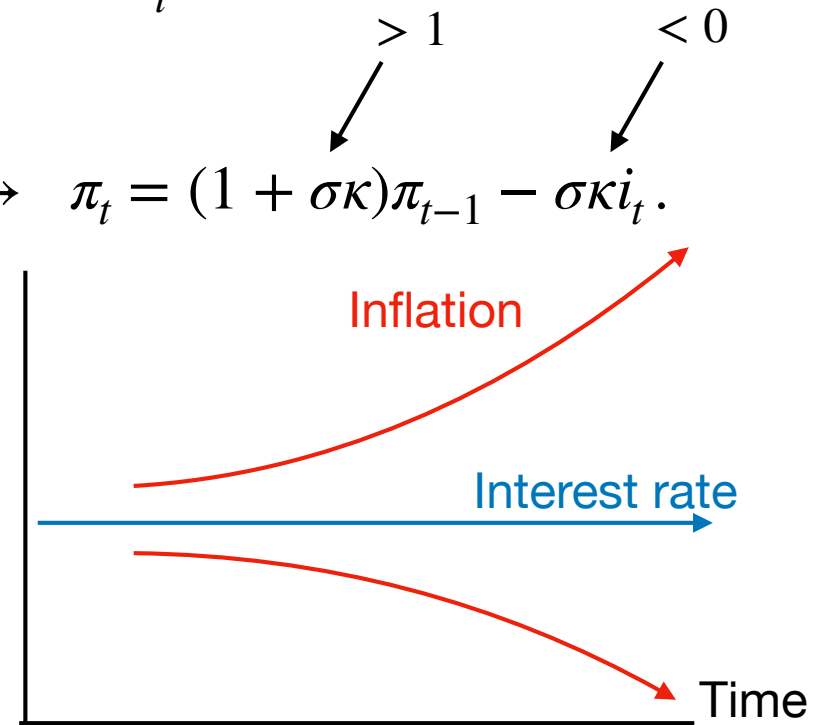
a) Higher rates lower inflation!

b) Friedman (1968): i peg is *unstable*.

c) Taylor rule + adaptive

$$i_t = \phi\pi_t \rightarrow \pi_t = \frac{1 + \sigma\kappa}{1 + \sigma\kappa\phi}\pi_{t-1}.$$

Fed stabilizes inflation with adaptive E.



Theory of inflation under interest rate targets (much simplified)

$$\begin{aligned}
 \text{Model} \quad & x_t = E_t x_{t+1} - \sigma(i_t - \pi_t^e) \\
 & \pi_t = \pi_t^e + \kappa x_t \\
 \text{Inflation dynamics} \quad & \pi_t = (1 + \sigma\kappa)\pi_t^e - \sigma\kappa i_t. \\
 & \pi^e = E_t \pi_{t+1} \rightarrow E_t \pi_{t+1} = \frac{1}{1 + \sigma\kappa} \pi_t + \frac{\sigma\kappa}{1 + \sigma\kappa} i_t
 \end{aligned}$$

$\swarrow < 1$
 $\searrow > 0$

2) Rational expectations

a) Sargent-Wallace (1975): Inflation is *stable*, but *indeterminate*.

b) New-Keynesian? $i_t = \phi \pi_t \rightarrow E_t \pi_{t+1} = \frac{1 + \phi\sigma\kappa}{1 + \sigma\kappa} \pi_t$

- Fed *destabilizes* inflation to select equilibria.
- Central banks don't do that.

c) Fiscal theory of the price level $\Delta E_{t+1} \equiv E_{t+1} - E_t$

$$\Delta E_{t+1} \pi_{t+1} = \Delta E_{t+1} \sum_{j=0}^{\infty} \rho^j (-\tilde{s}_{t+1+j} + r_{t+1+j});$$

- Inflation is *stable* and *determinate* (at last); obeys *long-run neutrality*. At least pretty!
- Frictionless neutral version

$$i_t = E_t \pi_{t+1}; \quad \Delta E_{t+1} \pi_{t+1} = - \Delta E_{t+1} \sum_{j=0}^{\infty} \tilde{s}_{t+1+j}$$

- Higher rates raise inflation, unless a fiscal shock.

