Slow Recoveries and Unemployment Traps: Monetary Policy in a Time of Hysteresis

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Motivation

Two potential explanations for slow recovery following Great Recession:

- *Permanent structural change* (secular stagnation), e.g.:
  - *permanently negative* $r^\star$ Eggertsson and Mehrotra (2014)
  - *productivity slowdown* Gordon (2015)
- *Hysteresis*: temporary recessions permanently damage "supply side", e.g. Blanchard and Summers (1986),Yellen (2016)

Implications for conduct of monetary policy

- *Permanent structural change* $\Rightarrow$ countercyclical policy ineffective at resisting or reversing trend?

- *Hysteresis* $\Rightarrow$ countercyclical policy, by limiting the severity of downturns, may have a role to play to avert such adverse developments

Environment and Findings

- Model environment:
  - nominal rigidities and zero lower bound
  - unemployed workers lose skill and are costly to retrain (Pissarides, 1992)
  - multiple steady states

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  - multiple steady states
- Model can generate slow recovery or even permanent stagnation following temporary shock
  - quantitatively accounts for recent U.S. slow recovery

Environment and Findings

- Model environment:
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  - unemployed workers lose skill and are costly to retrain (Pissarides, 1992)
  - multiple steady states
- Model can generate slow recovery or even permanent stagnation following temporary shock
  - quantitatively accounts for recent U.S. slow recovery
- Timing of monetary policy crucial
  - monetary policy may be unable to hasten recovery/avoid stagnation ex post
  - imperative to adopt accommodative policy early on to reduce structural damage to supply side

Model

Households

- unit mass of workers with preferences

$$\mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t c_t$$

- home production $b > 0$, save in nominal bond
- fraction of employed workers n_t evolves according to:

$$n_t = (1-\delta)n_{t-1} + q_t \overbrace{[\delta n_{t-1} + \underbrace{(1-n_{t-1})}_{u_{t-1}}]}^{l_t}$$

- workers unemployed for ≥ 1 period become unskilled
- fraction of unskilled workers $\mu_t = \frac{u_{t-1}}{l_t}$ evolves according to:

$$\mu_{t+1} = \frac{1-q_t}{1+(1-\delta)(1-q_t-\mu_t)}$$

Matching technology

Random search, CRS matching function

$$m(v_t, l_t) = \min\{v_t, l_t\}$$

- job-finding rate $q_t = \min\{\theta_t, 1\}$ where $\theta_t = v_t/l_t$
- job-filling rate $f_t = \min\{1/\theta_t, 1\}$
- $\theta_t < 1$: *slack labor market regime*
- $\theta_t \geq 1$: *tight labor market regime*

Firms

- Linear production technology: $y_t = An_t$, $A > b$
- Vacancy posting cost $\kappa > 0$, training cost χ per unskilled
- Value of filled vacancy: $J_t = A - \omega_t + \beta(1-\delta)J_{t+1}$
- Free entry:

$$f_t J_t \leq \kappa + f_t \mu_t \chi \qquad \text{and} \qquad \theta_t \geq 0 \text{ (at least one equality)}$$

- Wages via Nash bargaining (workers' bargaining weight η)

$$\omega_t^* = \eta A + (1-\eta)b + \beta(1-\delta)\eta q_{t+1} \underbrace{\left(\frac{\kappa}{f_{t+1}} + \chi\mu_{t+1}\right)}_{J_{t+1}}$$

Flexible Wage Benchmark

Steady states

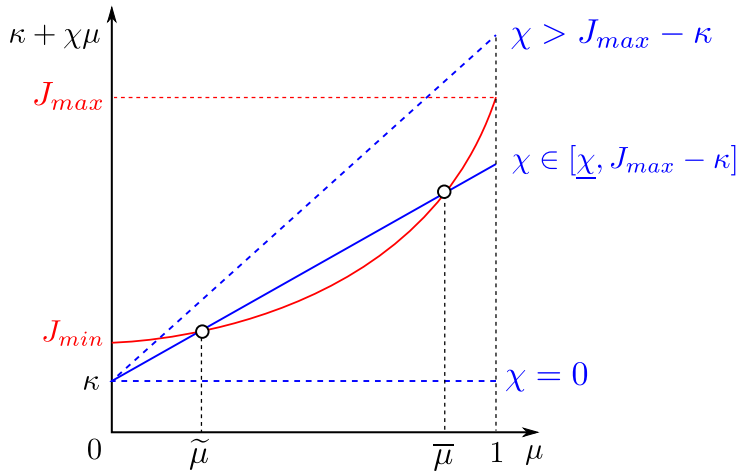
- Full employment steady state exists

$$n = 1 \qquad \mu = 0 \qquad q = 1 \qquad f = 1/\theta \leq 1$$

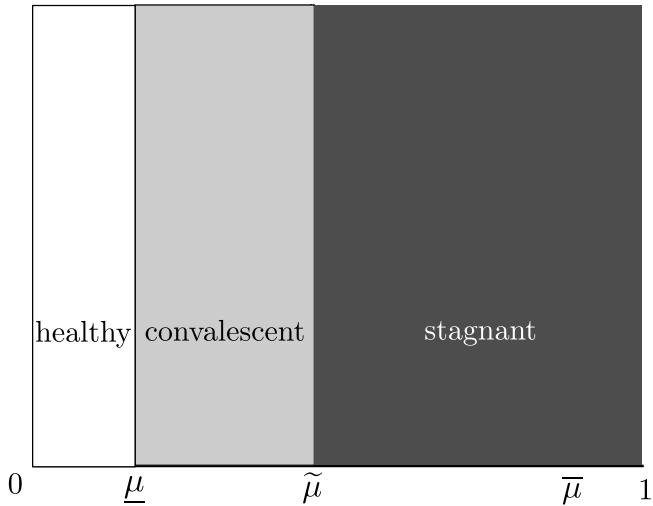
- For η, χ not too small, also steady states with unemployment

$$J_{ss}(\mu) = \frac{(1-\eta)(A-b)}{1-\beta(1-\delta)(1-\eta(1-\mu))} = \kappa + \chi\mu$$

Multiple steady states

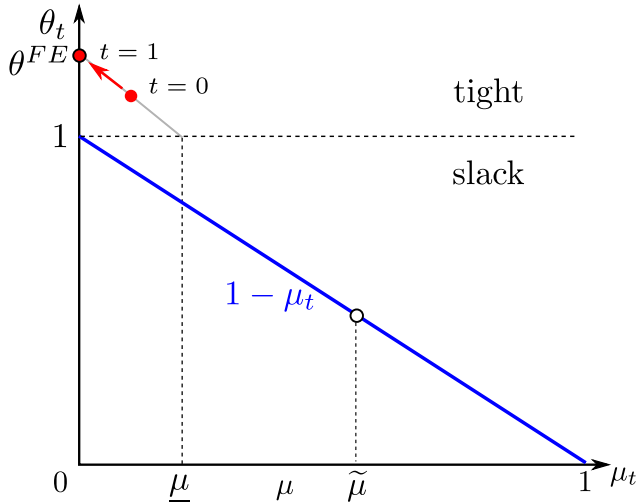


Dynamics


healthy
convalescent
stagnant
0
$\underline{\mu}$
$\widetilde{\mu}$
$\overline{\mu}$
1

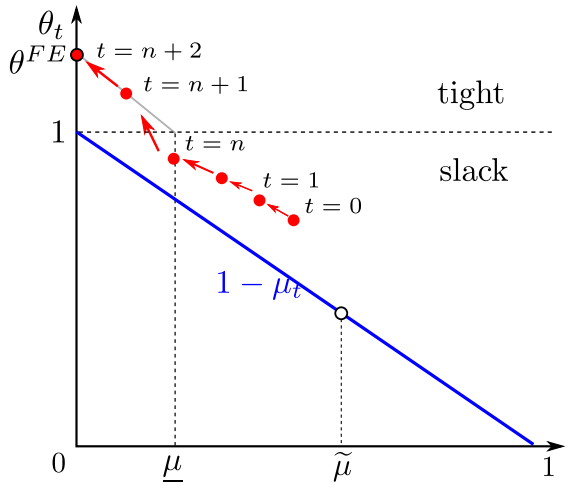
Healthy region

- Highly skilled workforce, low unemployment
- Low expected incidence of training cost
- High outside option of workers $\Rightarrow$ high wages
- Quick recovery to full employment



Convalescent region

- Moderately skilled workforce, moderate unemployment
- Higher expected incidence of training cost
- Lower job-finding rates/ lower outside option
- Slow recovery to full employment



Slow recovery in the convalescent region

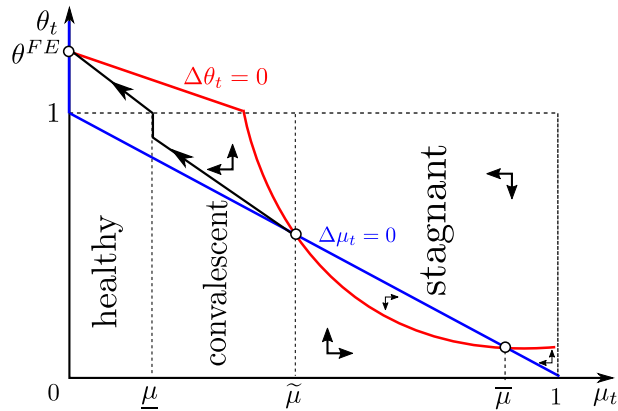
- Unlike in healthy region, firms unwilling to post vacancies unless slack labor markets persist.
  - wages low if persistently slack labor markets
- Wages in the convalescent region

$$\omega_t^* = \omega_{fe}^* - \chi \left\{ [1 - \beta(1-\delta)] \underbrace{(\mu_t - \underline{\mu})}_{\text{level effect}} + \beta(1-\delta) \underbrace{(\mu_t - \mu_{t+1})}_{\text{slope effect}} \right\}$$

  - wages lower today if economy close to healthy region
  - wages lower today if economy is expected to recover quickly

Slow Recoveries and Stagnation

- Economy in stagnant region *never* returns to full employment
- Same forces which cause slow recovery in convalescent region lead to stagnation in stagnant region
- not multiple equilibria: changes in beliefs *cannot* move economy from bad steady state to good steady state



Nominal Rigidities

Nominal rigidities, monetary policy, shocks

- Nominal wages cannot fall:

$$W_t = \max\{W_{t-1}, P_t \omega_t^*\}$$

where ω_t^* is the natural wage, given the current state μ_t.

- Monetary policy tries to replicate flexible-wage allocations under nominal wage stability, constrained by ZLB.
- Shock: at date 0, $\mu_0 = 0$, β increases to $\beta_0 > 1$ for one period only

Monetary policy

- Euler equation:

$$1 = \beta_t(1 + i_t)\frac{P_t}{P_{t+1}} \qquad \text{or} \qquad \frac{P_{t+1}}{P_t} = \beta_t(1 + i_t)$$

- monetary policy sets i_t so that

$$P_t \leq \frac{W_{t-1}}{\omega^*(\mu_t)}, \qquad i_t \geq 0, \qquad \text{with at least one equality}$$

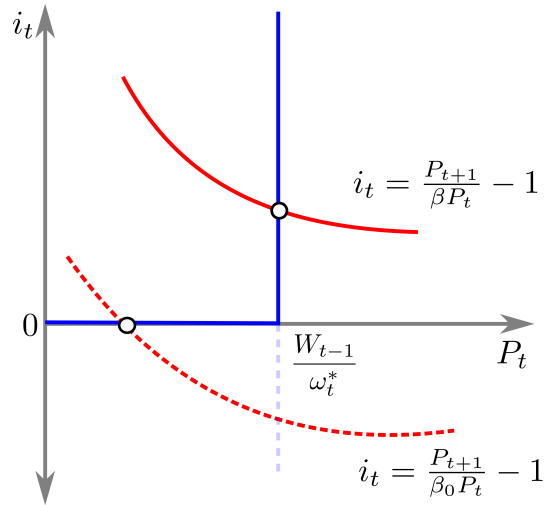
  - implementation via "L-shaped Taylor rule"

$$1 + i_t = \max\left\{1, \beta_t^{-1}\left(\frac{P_t}{W_{t-1}/\omega^*(\mu_t)}\right)^{\phi}\right\}, \qquad \phi \to \infty$$

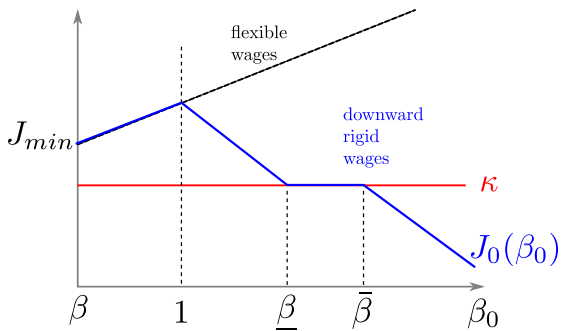
- ZLB $i_t \geq 0$ is equivalent to

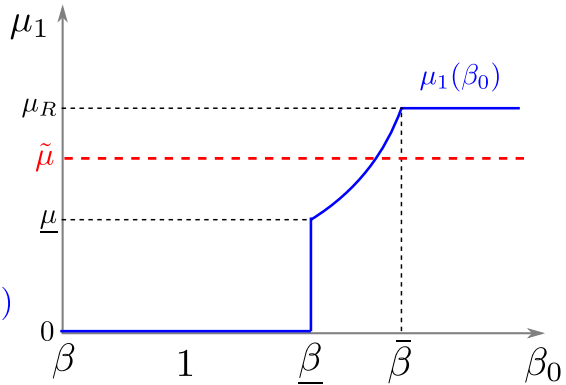
$$\frac{P_{t+1}}{P_t} \geq \beta_t$$

$\beta_0 > 1$ makes ZLB bind, causing prices to fall



Large enough $\beta_0 > 1$ causes $J_0 \leq \kappa$, $\mu_1 > 0$





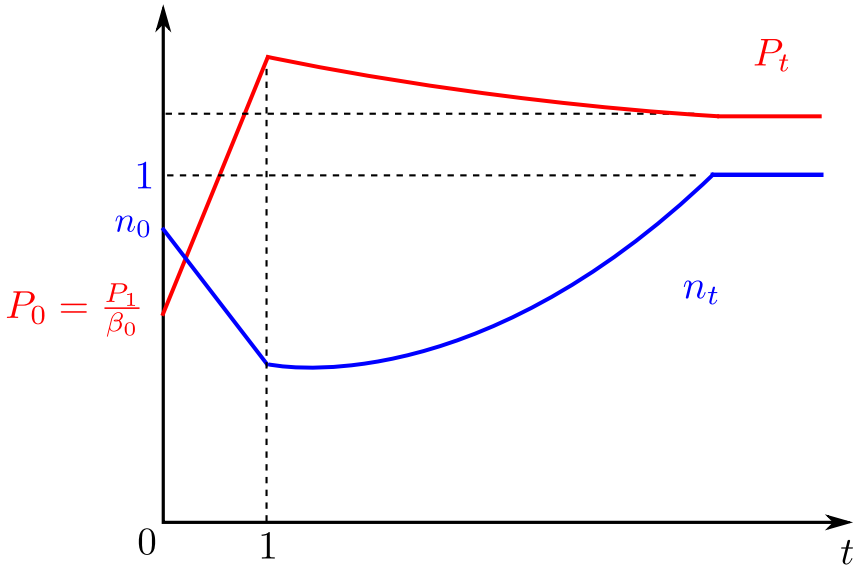
Temporary shocks and permanent effects

Proposition

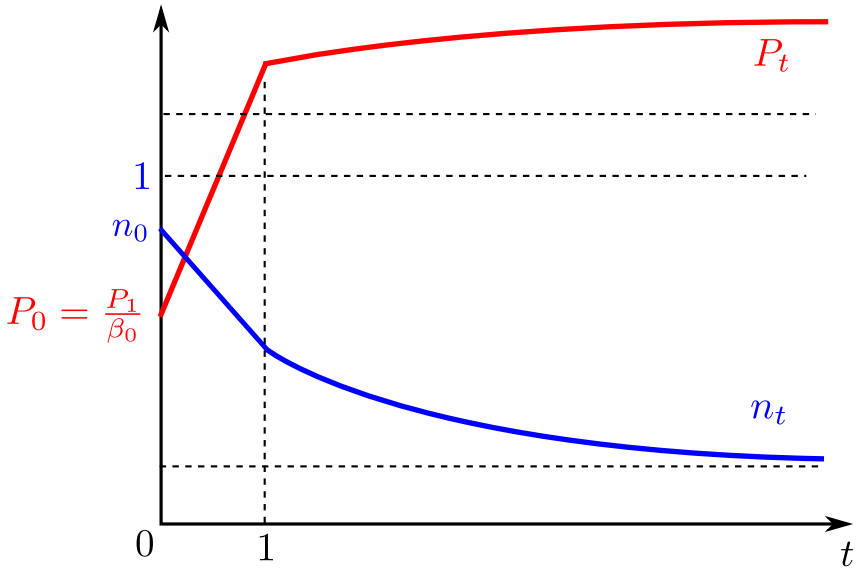
There exists $\underline{\beta} > 1$ such that if $\beta_0 > \underline{\beta}$, hiring falls ($\theta_0 < 1$) and economy leaves healthy region ($\mu_1 > \underline{\mu}$)

- *If $\mu_1 < \tilde{\mu}$, slow recovery: economy eventually returns to full employment*
- *If $\mu_1 \geq \tilde{\mu}$, permanent stagnation: economy never returns to full employment*

Slow recovery



Permanent stagnation



Persistently high unemployment without deflationary pressure

- Model consistent with no deflationary pressure even with persistently high unemployment
- Interpreting experience through standard Phillips curve:

$$\pi_t^W = -\kappa(u_t - u_t^*)$$

"u_t and u_t^* move together", u_t^* slow to return to steady state.

Unconventional policies

Avoiding liquidity trap requires commitment to higher nominal wage/price level from date 1 onwards

Proposition

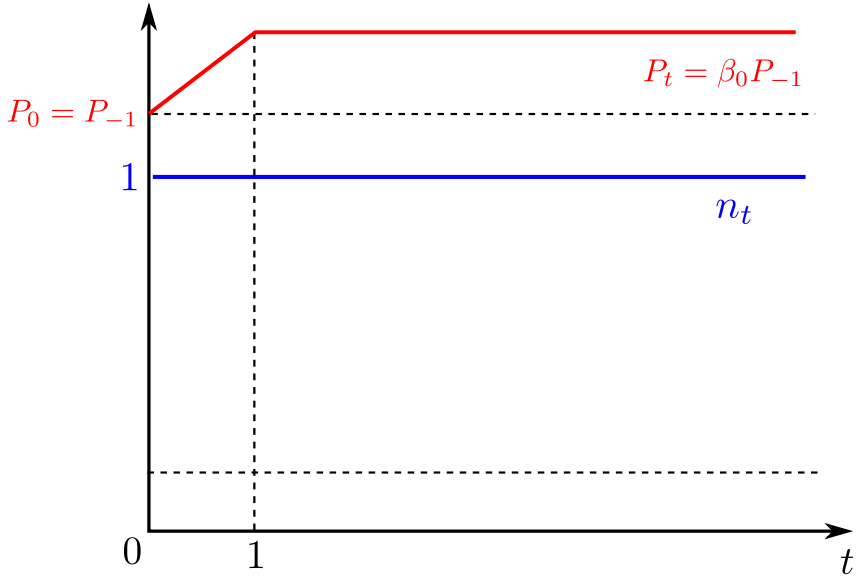
If monetary policy implements a price sequence $P_0 = P_{-1}$, $P_t = \beta_0 P_{-1}$ *for* $t > 0$, *the unique equilibrium features full employment for all* t.

- prevents deflation, unemployment, and persistent/permanent damage

- form of forward guidance, but different mechanism than standard NK model

NK model

Unconventional policies



Speed up recovery / escaping unemployment traps

- Once economy enters stagnant region, can monetary policy escape?
- Stark dichotomy: mp can prevent recession at date 0, but powerless at date 1
- Can relax (commitment, upward sticky nominal wages) but general lesson: important to frontload accommodation, risks of inaction asymmetric
- In standard NK models, cost of not being accommodative early transitory
  - e.g. Eggertson Woodford (2002): delaying accommodation costly in short run
  - can speed up recovery even if initial stimulus missing
  - single steady state: even if no accommodation, economy returns to same LR path
- "Optimal loss function" : relatively more weight on stabilizing employment

Multiple Equilibrium vs Multiple Steady State

Benigno and Fornaro (2017), Schmitt-Grohe and Uribe (2017): self-fulfilling ZLB and accompanying high unemployment

Key differences:

- high unemployment can persist even after monetary policy is no longer constrained by the ZLB
- *path dependence*: optimistic beliefs cannot free economy from unemployment trap

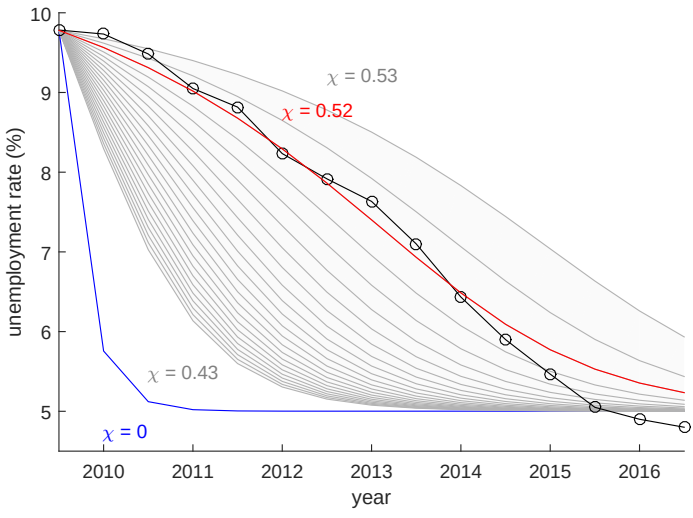
Hysteresis since the Great Recession

Can this help explain the slow recovery?

Numerical exercise:

- $m(v, l) = \frac{vl}{(v^\iota + l^\iota)^{\frac{1}{\iota}}}$
- 1 period = 6 months
- calibrate all parameters except χ to U.S. economy parameters
- What value of χ can match slow decline of U.S. unemployment since 2009 peak?

The slow recovery



Is $\chi = 0.52$ reasonable?

- $\chi = 0.52 \approx 3$ months of output
- Barron et al. (1989): on average, new hire spends 151 hours on training
  - if only unskilled workers require training (upper bound), cost per unskilled worker

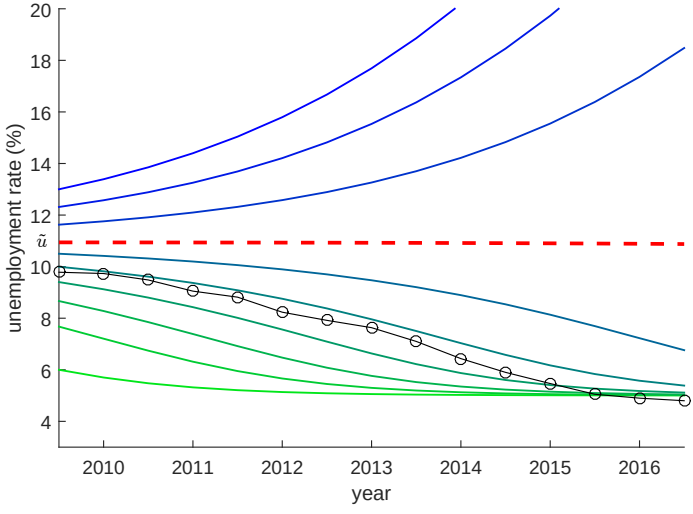
$$\frac{151}{0.2 \times 1043.5} = 0.72$$

  assuming 2087 hour work-year

- Paradise (2009): average training expenditure 2.24% of annual payroll

$$0.0224 = \frac{\chi \mu \delta (1-u)}{w(1-u)} \Rightarrow \chi = 0.48$$

Consequences of alternative policy course



Conclusion

- Skill depreciation, nominal rigidities, constraints on monetary policy allow temporary shocks to create slow recoveries or permanent stagnation
- Very different positive and normative implications from models only featuring "deviations from trend"
- Accommodative policy can avoid adverse outcomes, but only if enacted in a timely manner
- Once the damage has been done, monetary policy may not be able to escape unemployment trap

THE END

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New Keynesian models

$$c_0^{-\sigma} = \beta_0 c_1^{-\sigma}(1 + i_0)\frac{P_0}{P_1}$$

- If $\beta_0 > 1$, i_0 constrained by ZLB, P_0 sticky, then $r_0 > r_0^* \Rightarrow c_0 \downarrow$ (recession)
- Policies that raise P_1 (and c_1) stimulate c_0 via intertemporal substitution
- debate about strength of this channel (Del Negro et al. (2015), Kaplan et al. (2016))

back

Our model

$$1 = \beta_0(1 + i_0)\frac{P_0}{P_1}$$

- If $\beta_0 > 1$, inflation fixed by ZLB. recession despite $r_0 = r_0^*$ (by construction)
- Policies that raise P_1 raise P_0, encourages hiring.

- does not depend on strength of intertemporal substitution channel

back

Parameters

β	0.98	4% annual real interest rate
A	1	normalization
ι	0.5	Menzio and Shi (2011)
η	0.7	Shimer (2005)
b	0.59	70% replacement ratio (Hall, 2009)
δ	0.21	20% of job seekers long term unemployed
κ	$f_{ss}(J_{ss} - \chi\mu_{ss})$	5% steady state unemployment

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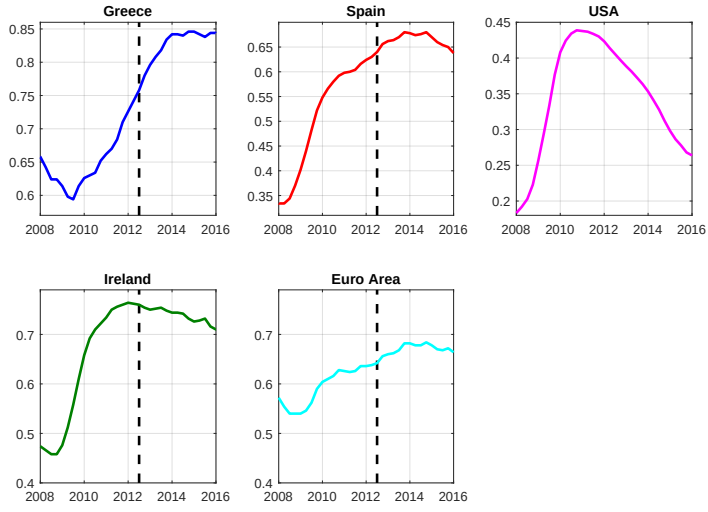
Fraction of Long-term unemployed



Duration as function of χ