Macroeconomic Stabilization and Aggregate Demand: A HANK&SAM Perspective

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Introduction

Extremely influential New Keynesian macroeconomics literature of the 1980's onwards

- Frictions in wage and price setting in dynamic stochastic general equilibrium model
- Combined rigor of micro-founded macro models with empirically relevant frictions in goods and labor markets
- Formed the basis of much research into the sources and properties of macroeconomic fluctuations
- Formed the basis of optimal policy analysis
- Been extremely important as a tool for **policy communication**
- Been extremely important as a tool for **policy guidance**

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- "Are there circumstances in which changes in aggregate demand can have an appreciable, persistent effect on aggregate supply?"
- "What determines inflation? [...] Although inflation fell during the recession, the decline was quite modest given how high unemployment rose"

HANK&SAM

HANK+SAM addresses these concerns

Key building blocks

- Heterogeneous agents and incomplete markets (HA),
- Sticky prices (NK),
- Search and matching (SAM).

Key implication: Endogenous risk wedge due to lack of (social) insurance against unemployment and wage risk

ADEMU has been very active in this

- Bonn (Bayer) / BGSE (Debortoli, Gali) / Cambridge (Rendahl) / EUI (Lagerborg, Pappa) / UCL (Luetticke, Ravn, Sterk)
- ADEMU workshop @ UCL, May 2017, Several papers published / PhD students

HANK & SAM: Key Insights

1. The endogenous risk wedge: Contraction / expansion in **aggregate demand** for precautionary savings reasons

- Arises because of lack of insurance

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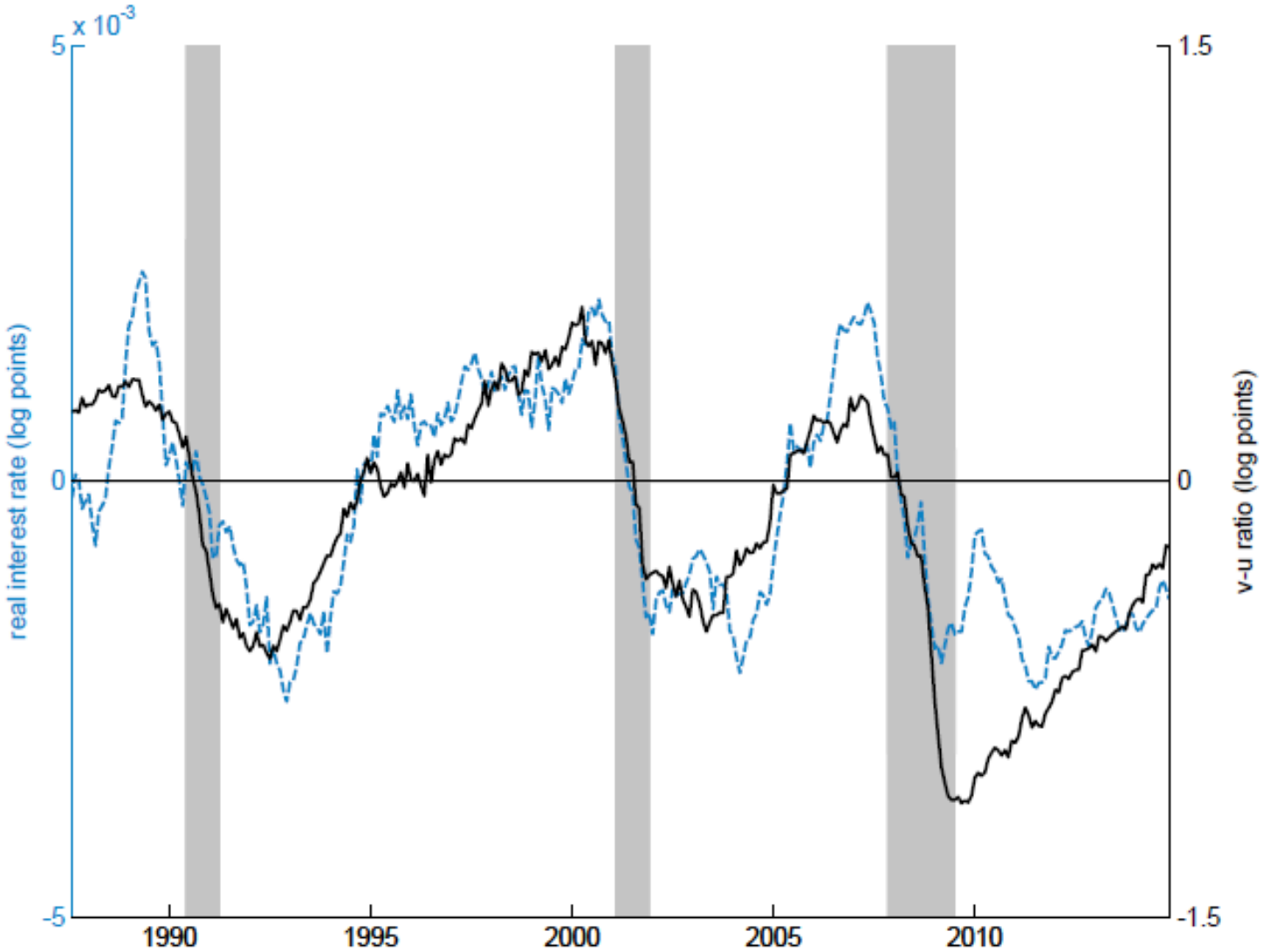
- Creates a role for demand

Countercyclical Risk: Real Rates and Tightness



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- Exogenous earnings risk matters little.
- **Incomplete markets matters little w/o sticky prices**.

HANK & SAM: Key Insights

2. HA + NK + SAM: Main results

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5. **Supply side reform** in a liquidity trap
6. **Fiscal policy:** Can stabilize demand channel

HANK & SAM: Building Blocks

Households

- Search for jobs.
- Face uninsurable unemployment risk.
- Save in bonds and equity.

Firms

- Monopolistically competitive.
- Face Rotemberg (1982) quadratic price adjustment costs.
- Hire labor in frictional matching market.

Monetary Authority

- Set short term nominal interest rate subject to ZLB.

HANK & SAM: Building Blocks

- **Households**: Savings decision which depends on intertemporal and precautionary motives

$$c_{e,t}^{-\mu} = \beta \mathbb{E}_t \frac{R_t}{\Pi_{t+1}} \quad (\underbrace{p_t^{eu} c_{u,t+1}^{-\mu}}_{\text{if job is lost}} + \underbrace{p_t^{ee} c_{e,t+1}^{-\mu}}_{\text{if job is retained}})$$

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$$\Pi_t = \mathbf{F} \left(\mathbb{E}_t \sum_{s=0}^{\infty} \Lambda_{t,t+s} \mathbf{mc}_{t+s} \right)$$

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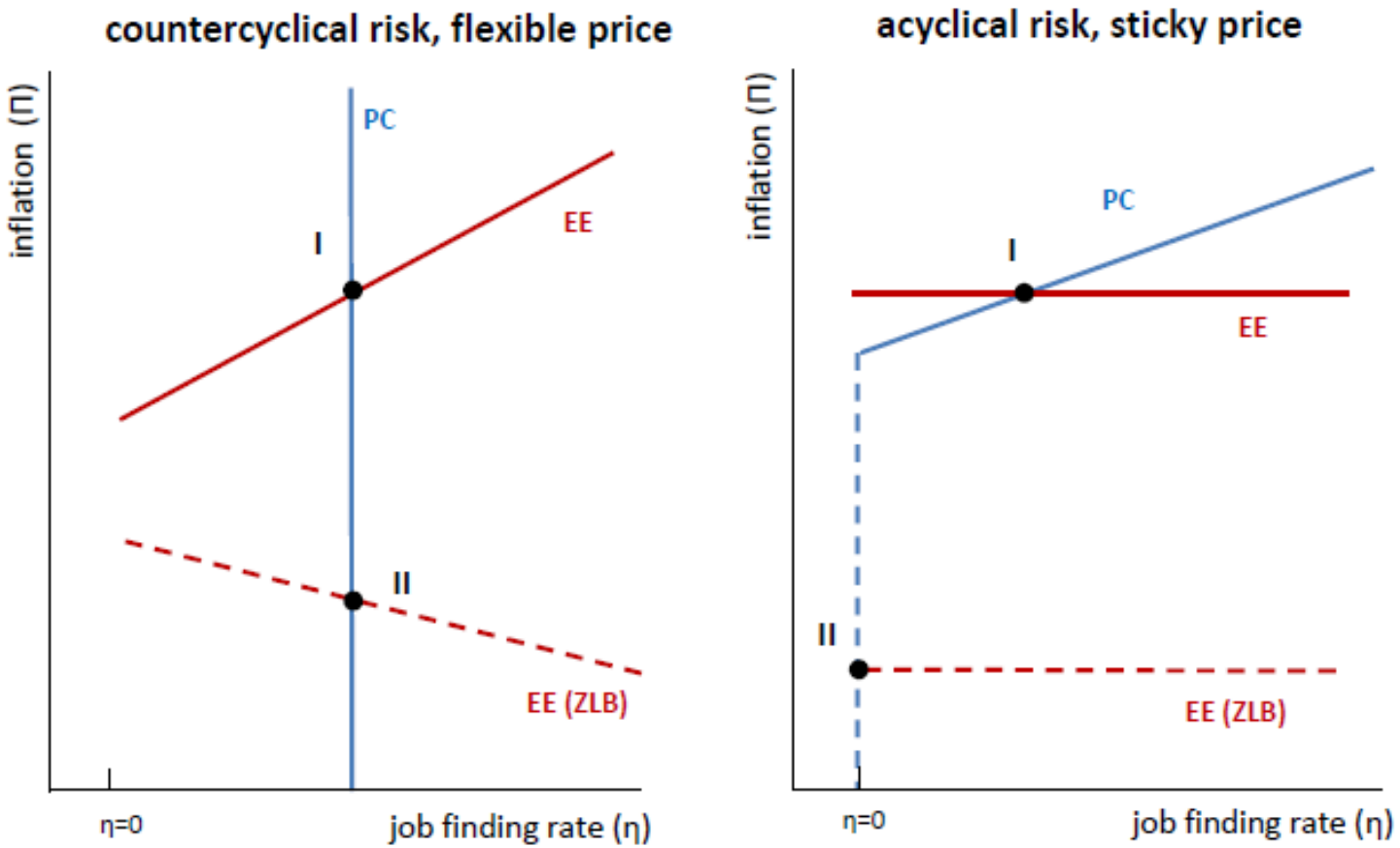
- **Monetary Authority**: Attempt to stabilize the economy through monetary instrument

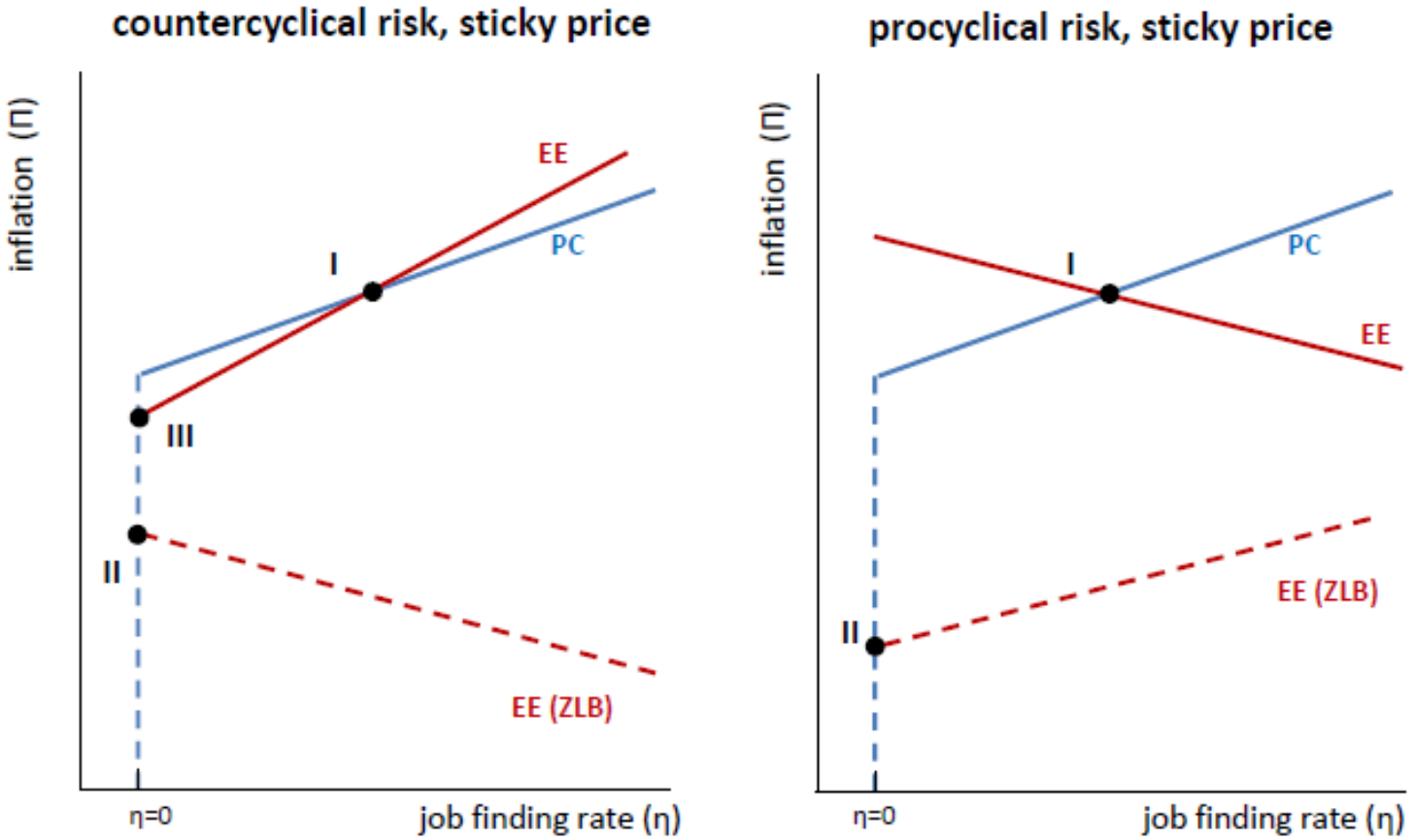
Equilibrium Properties

Steady-States



- An intended steady-state and a ZLB liquidity trap

Steady-States



- if countercylical risk sufficiently strong: New steady-state - **the unemployment trap**

The Unemployment Trap

Unemployment trap:

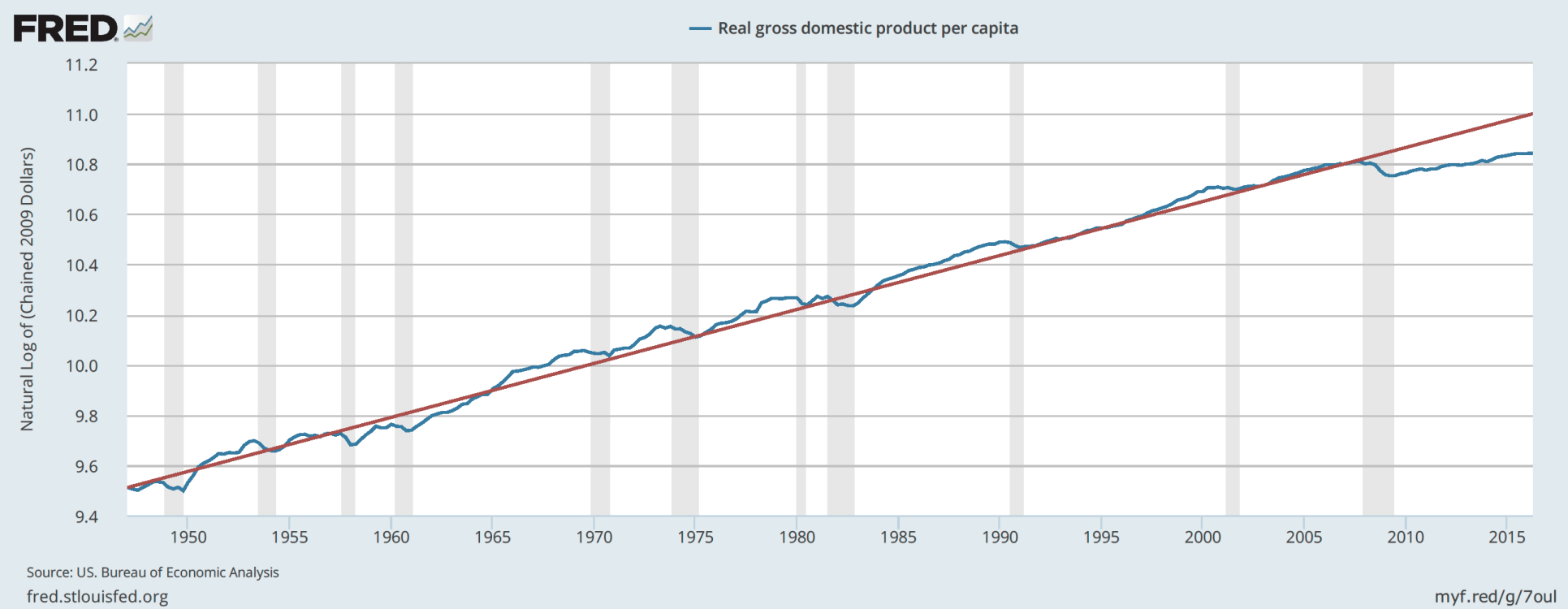
- Can arise when prices are sticky **and** risk is countercyclical
- Unemployment trap has high unemployment and low but **positive** inflation
- less likely the more aggressive the central bank is and the lower are hiring costs

Intuitively: **Self-fulfilling equilibrium**

- expectations of low job finding rates $\Rightarrow$ increase in precautionary savings $\Rightarrow$ decline in demand $\Rightarrow$ decline in real interest rates $\Rightarrow$ decline in marginal costs and in hiring $\Rightarrow$ low job finding rate

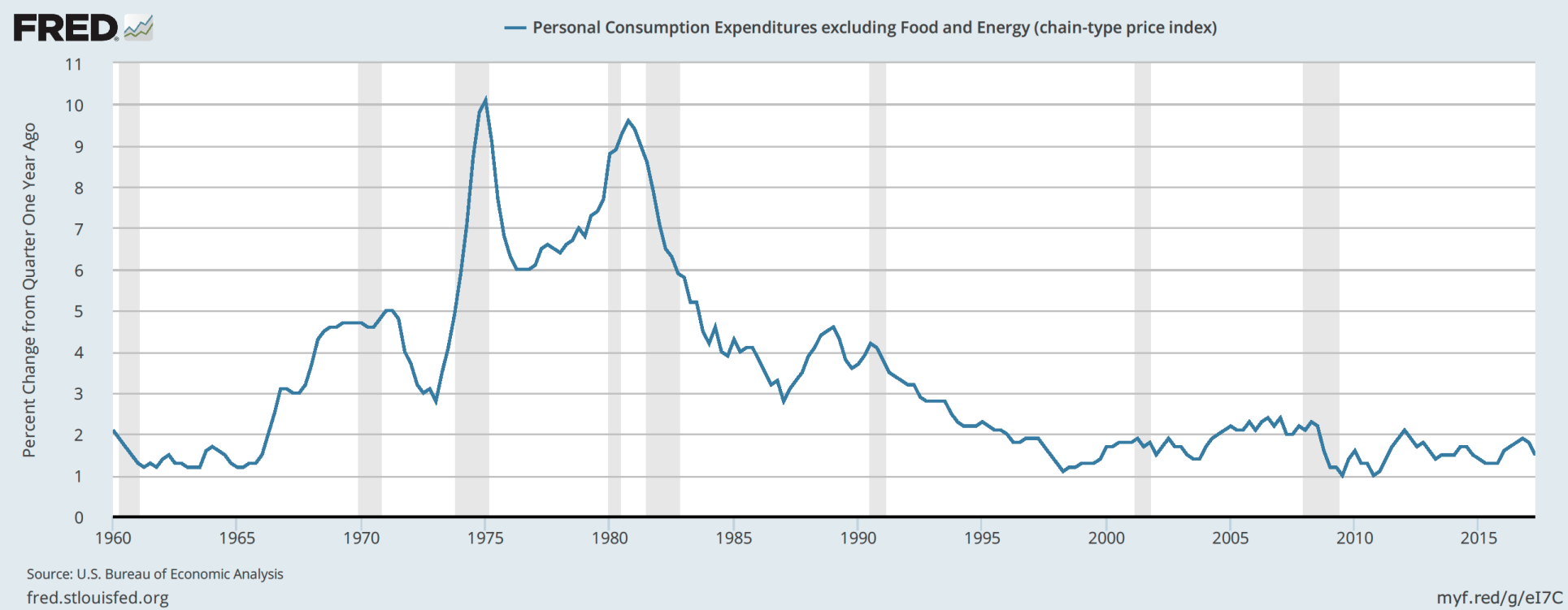
Similar to **secular stagnation** (Hansen, 1939, Summers, 2011, Eggertsson & Mehrotra, 2014)

Secular Stagnation



- Large and persistent drop in US GDP per capital since Great Recession

Secular Stagnation



- Core Inflation has been low but positive (apart from 2 quarters) since Great Recession.

Fluctuations

An equation :

- **Employed agents' Euler equation** :

$$-\widehat{c}_{e,t} + \beta\overline{R}\mathbb{E}_s\widehat{c}_{e,t+1} = \frac{1}{\mu}\left(\widehat{R}_t - \mathbb{E}_t\widehat{\Pi}_{t+1} - \underbrace{\beta\overline{R}\Theta^F\mathbb{E}_t\widehat{\eta}_{t+1}}_{\text{incomplete-markets wedge}}\right)$$

1. **Discounting**: $\widehat{c}_{e,s+1}$ enters with coefficient $\beta\overline{R} < 1$: Incomplete markets impact through steady-state real interest rate below $1/\beta$
2. **Incomplete markets wedge**:

$$\Theta^F \equiv \omega\eta\left((\vartheta/w)^{-\mu} - 1\right) - \chi\mu\omega\left(1-\eta\right)$$

- **procyclical** if $\Theta^F < 0$
- **countercyclical** if $\Theta^F > 0$

Fluctuations

Properties Close to Intended Steady-State :

1. Local determinacy : Taylor principle is insufficient when risk is countercylical

- Stability requires policy to be more aggressive than prescribed by Taylor principle
- Economies with inefficient goods markets and lack of social insurance particularly sensitive to instability

2. Impact of productivity shocks

- Countercyclical risk amplifies impact of productivity shocks: Demand contracts over and above income loss in bad times
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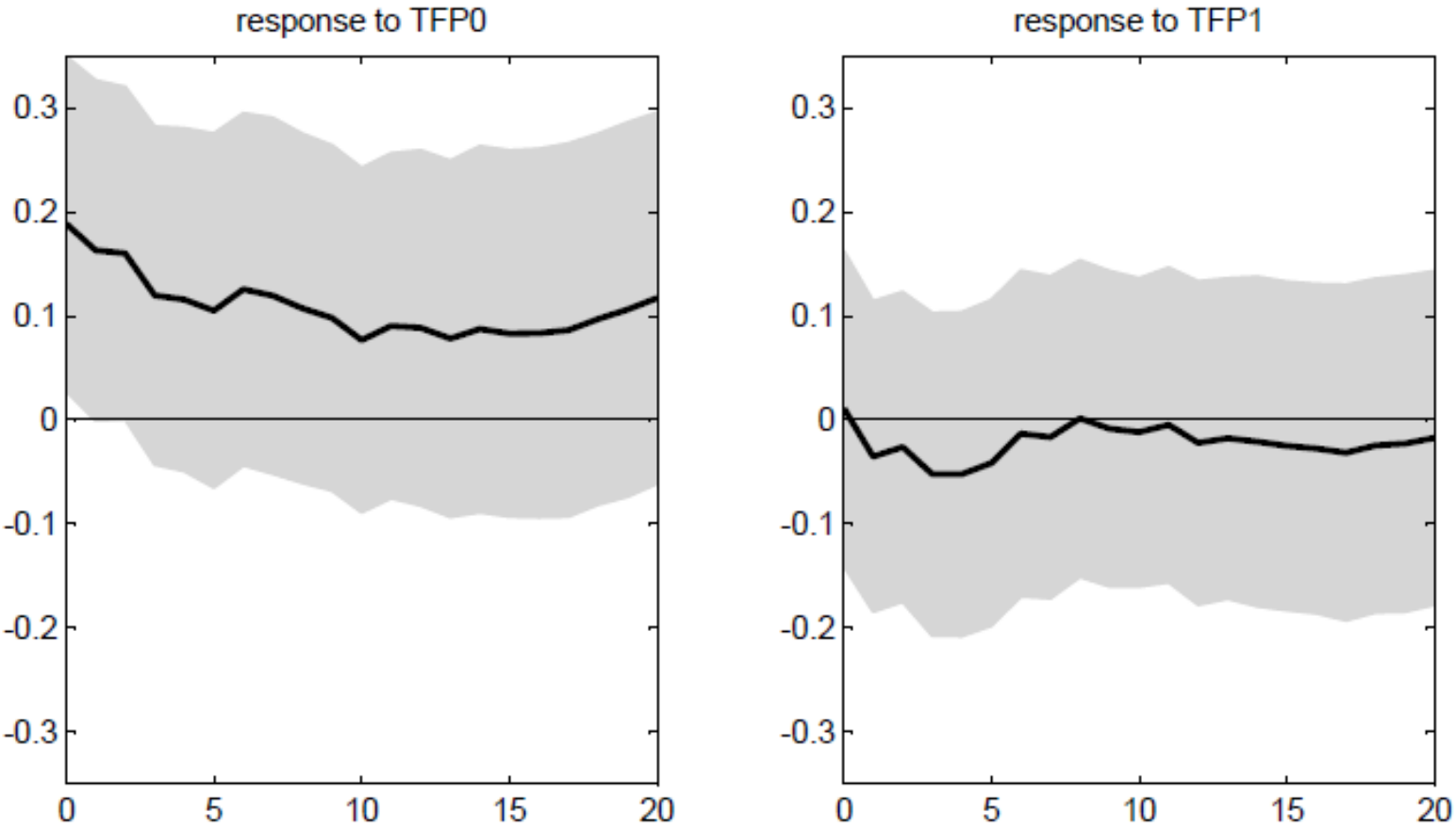
Productivity shocks



- Local projection estimates of impact of Fernald TFP shocks on CPI inflation

Liquidity Trap Sources

Low productivity may induce Liquidity Trap

- **Complete markets/Procyclical risk**: Negative productivity shocks stimulates inflation and desire for borrowing.
- **Countercyclical risk**: Negative productivity shocks stimulate precautionary savings due to endogenous earnings risk.

HANK&SAM: ZLB may be induced by negative productivity shocks if nominal interest rate declines in response to contractionary shock.

Missing Deflation

Inflationary liquidity traps

Incomplete markets and endogenous risk:

$$(R/\Pi)^{SS} = 1/\left(\beta\Theta^{SS}(\eta)\right) < 1/\beta$$

Following two conditions must be fulfilled when the ZLB binds:

$$\begin{aligned}\Pi^{LT} &= \beta\Theta^{SS}\left(\eta^{LT}\right) > \beta, \\ \Pi^{LT} &< \overline{\Pi}\overline{\theta}^{\delta_\theta/\delta_\pi}\overline{R}^{-1/\delta_\pi}\left(\eta^{LT}\right)^{-(\delta_\theta/\delta_\pi)/(1-\alpha)}.\end{aligned}$$

- Worsening labor market conditions increases precautionary savings, brings down inflation and ZLB may be reached at positive inflation rate

Supply Shock Paradox at ZLB

Supply shock paradox:
Complete Markets: Eggertsson and Krugman (2012), Wieland (2015):

- Positive productivity shock increase real interest rate $\Rightarrow$ increase in consumption growth $\Rightarrow$ decline in current consumption.

HANK and SAM: Supply shock stimulates demand if risk wedge is countercylical

Summary

HANK with SAM: New framework for macroeconomic fluctuations.

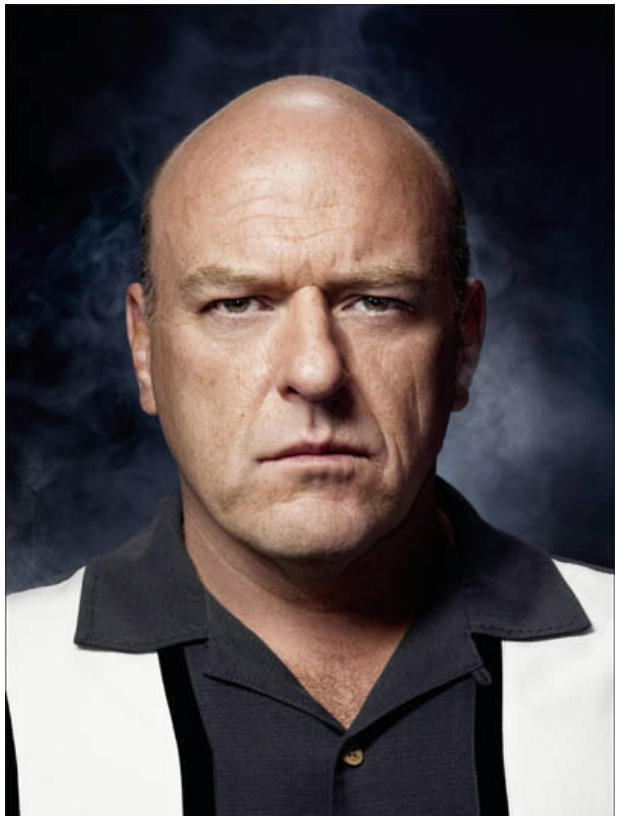
- Combines frictional markets approach of NK literature with incomplete markets models and SAM.
- Key mechanism: **Endogenous countercyclical unemployment risk** induces amplification.
- Key is interaction between frictions.
- Results can be generalized to full support wealth distribution.

Progress?

- We started with **R**epresentative **A**gent **Mon**etary model (RAMON)

HANK & SAM

- and went to:



Heterogeneous Agents New Keynesian

Search and Matching

HANK + SAM

New Keynesian Models

Traditional NK literature: Nominal rigidities and Representative agent

- Medium scale NK models match macro time series data very well (Christiano, Eichenbaum, and Evans, 2005, Smets and Wouters, 2007)
- Intuition from stripped-down counterpart (Clarida, Gali, Gertler, 2000)
- Newer literature includes unemployment
- Even newer literature includes financial frictions

Issues: Relies on representative agent/insurance

- Does not match up well to household data
- Cannot easily speak to impact of inequality
- No or little costs of unemployment
- Little endogenous propagation/amplification
- Data puzzles

Households - Preferences

Due to market incompleteness: Idiosyncratic earnings risk

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- $p_t^{ee} c_{e,t+1}^{-\mu}$: **Procyclical risk** - wages rise in good times inducing higher precautionary and intermporal savings

Matching Market

Due to matching frictions: Unemployment risk is endogenous and cyclical

$$\begin{aligned} \mathbf{M}(e_s, v_s) &= \overline{m} e_s^{\alpha} v_s^{1-\alpha}, \\ v_s &= \int_j v_{j,s} dj \end{aligned}$$

- **Matching rates**: Let $\theta_s = v_s / e_s$ denote labor market tightness:

$$\textbf{job finding rate} \quad : \quad \eta_s = \frac{\mathbf{M}_s}{e_s} = \overline{m} \theta_s^{1-\alpha}$$

$$\textbf{vacancy filling rate} \quad : \quad q_s = \frac{\mathbf{M}_s}{v_s} = \overline{m}^{1/(1-\alpha)} \eta_s^{-\alpha/(1-\alpha)}$$

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- Firms increase vacancy postings - job finding rate increase **and** idiosyncratic unemployment risk declines

Prices

Sticky prices: Firms set prices in response to variations in demand and in supply

$$\begin{aligned} y_{j,s} &= \exp(A_s)\, n_{j,s} \\ y_{j,s} &= \left(\frac{P_{j,s}}{P_s}\right)^{-\gamma} y_s \end{aligned}$$

- prices and marginal costs:

$$\begin{aligned} \Pi_t &= \mathbf{F}\left(\mathbb{E}_t \sum_{s=0}^{\infty} \Lambda_{t,t+s} \mathbf{mc}_{t+s}\right) \\ \mathbf{mc}_t &= \frac{w_t + \Omega_t}{\exp(A_t)} \\ \Omega_t &= \left(w_t + \frac{\kappa}{q_t} - \lambda_t + \beta(1-\omega)\,\mathbb{E}_t \Lambda_{t,t+1}\left(\frac{\kappa}{q_{t+1}} - \lambda_{t+1}\right)\right) \end{aligned}$$

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Monetary policy design: Local determinacy

Result 2: Breakdown of Taylor Principle : $(\delta_\pi = 1/\beta)$ Monetary needs to be more aggresive to stabilize the less social insurance is provided

$$\underbrace{\frac{\phi}{\gamma}}_{\text{price rigidity}} \left(\underbrace{\beta^2 \overline{R} \Theta^F}_{\text{end. risk}} - \underbrace{\frac{\beta \delta_\theta}{1-\alpha}}_{\text{mon.policy}}\right) < \underbrace{\frac{\kappa}{q} \frac{\alpha}{1-\alpha} \left(1 - \beta \left(1 - \omega\right)\right)}_{\text{search and matching}}$$

1. **Price rigidity**: $\phi = 0$ (flexible price) implies local determinacy. The more sticky are prices, the less likely is local determinacy.
2. **Complementarity**: $\gamma \to \infty$ (lack of monopoly power) implies local determinacy. Higher market power makes local determinacy less likely.
3. **Risk wedge**: $\Theta^F|_{\chi=0} > 0$, higher Θ^F makes local determinacy less likely especially the more sticky prices are.
4. **Hiring frictions**: The higher is κ, the more likely is local determinacy.

Productivity shocks

$$\begin{aligned}\widehat{\eta}_t &= \Gamma_{\eta}^{A} A_t \\ \widehat{\Pi}_t &= \Gamma_{\Pi}^{A} A_t\end{aligned}$$

- $\Gamma_{\eta}^{A}\left(\Theta^{F} > 0\right) > \Gamma_{\eta}^{A}\left(\Theta^{F} < 0\right)$: Amplification through demand
- $\Gamma_{\Pi}^{A}\left(\Theta^{F} < 0\right) < 0$
- $\Gamma_{\Pi}^{A}\left(\Theta^{F} >> 0\right) > 0$

Higher productivity stimulates demand so much that inflation may rise