

Unemployment (Fears), Precautionary Savings, and Aggregate Demand

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What we do

Show that the interaction between

- 1 One friction in **financial markets**: **incomplete risk sharing**
- 2 Two frictions in **labor markets**:
 - **sticky nominal wages**: $dW/dP < 1$
 - **matching**

can

- give rise to "aggregate demand" like propagation from supply shocks
- lead to novel policy implication regarding unemployment insurance (UI)

Interaction of two frictions key

- Complete risk sharing \implies
Sticky nominal wages **dampen** effect shocks
- Flexible nominal wages \implies
Incomplete risk sharing **dampens** effect shocks
- Both shocks **magnify** effect shocks

Key components behind these results

- Aggregate risk
 - UI policy implications different without aggregate risk
- Asset price volatility
- Portfolio rebalancing towards liquid/unproductive asset during recession
- Nonlinearities induced by standard matching framework

Four cases

- ① Complete markets and flexible wages
- ② Complete markets and sticky wages
- ③ Incomplete markets and flexible wages
- ④ **Benchmark:** Incomplete markets and sticky wages

Case 1: flexible wages & complete markets

usual matching stuff:

- productivity $\downarrow \implies$
- expected future productivity $\downarrow \implies$
- job creation $\downarrow \implies$
- employment rate $\downarrow \implies$
- unemployment rate $\uparrow \implies$
- expected duration unemployment \uparrow

Case 2: Sticky nominal wages & complete markets

- productivity $\downarrow \implies$
- **Upward** pressure on prices \implies
 - downward pressure on *real* wages \implies
 - nominal wage rigidity **dampens** shocks!

Case 3: Flexible nominal wages & incomplete markets

- productivity $\downarrow \implies$
- investment in job creation $\downarrow \implies$
- unemployment $\uparrow \implies$
- idiosyncratic risk $\uparrow \implies$
- precautionary savings $\uparrow \implies$
- reduction in job creation is smaller \implies
- incomplete markets **dampens** shocks

Case 4: Sticky nominal wages & incomplete markets

- Incomplete markets: Precautionary savings \uparrow when unemp $\uparrow \implies$
- precautionary demand for money $\uparrow \implies$
- **downward** pressure on $P \implies W/P \uparrow$ (sticky W) \implies
- job creation investment \downarrow **by more not by less!** \implies
- unemployment rate $\uparrow \implies$
- precautionary savings $\uparrow \implies$ etc.
- \implies **deflationary spiral**

Risk for unemployed \implies countercyclical $W/P \implies$ volatile asset prices

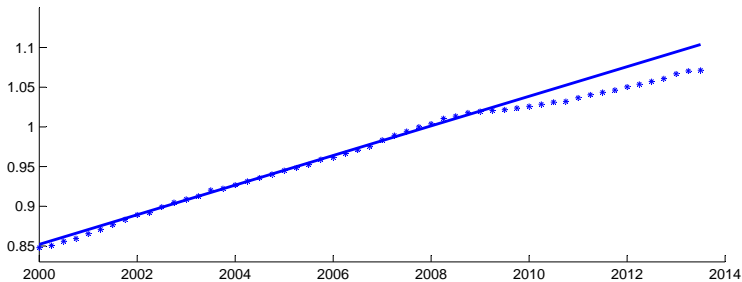
Main results

- ① Incomplete markets together with sticky wages amplify shocks, but on their own repress shocks
- ② Increase in unemployment insurance from 50% to 55% \implies **everybody** better off
 - not true in economy without aggregate risk

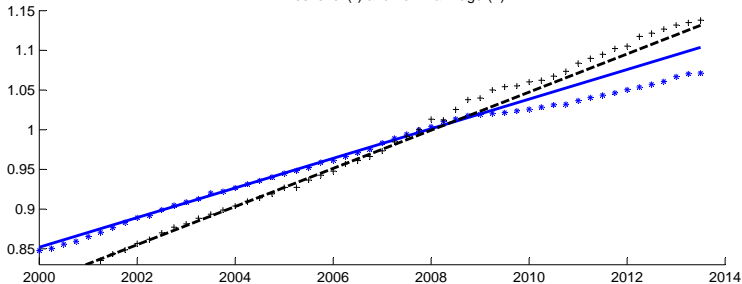
Just a little bit of empirical motivation

Euro Area

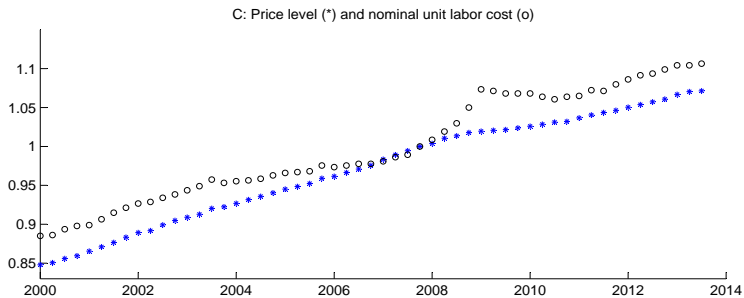
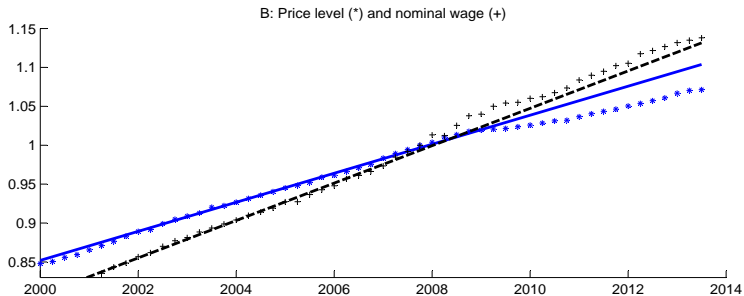
A: Price level (*)



B: Price level (*) and nominal wage (+)



Euro Area



Model: Key ingredients

- ➊ Heterogeneous households and incomplete markets
- ➋ Nominal wages do not respond 1-for-1 with P
- ➌ Search frictions in the labor market
- ➍ # jobs = # firms = # shares

Existing firms

- One-worker firms
- Profits are given by

$$D_t = P_t \exp(z_t) - W_t$$
$$W_t = \omega_0 \left(\frac{z_t}{\bar{z}}\right)^{\omega_z} \bar{z} \left(\frac{P_t}{\bar{P}}\right)^{\omega_p} \bar{P}$$

- Key parameter is $\omega_p \leq 1$
- Active firms do not make decisions

Individual households

- one-worker households
- employed workers earn nominal wage $(1 - \tau_t) W_t$
- unemployed earn $\mu (1 - \tau_t) W_t$ & search for jobs
- idiosyncratic risk
 - exogenous job loss probability, δ
 - lower chance of getting a job in a recession
- agents can save/invest in
 - unproductive asset: money, $M_{i,t}$
 - productive asset: equity, $q_{i,t} \geq 0$ (i.e., firm ownership/jobs)

Individual households

$$\max \mathbb{E}_t \left[\sum_{j=0}^{\infty} \beta^j \left(\left(\frac{c_{i,t+j}^{1-\gamma} - 1}{1-\gamma} \right) + \chi \frac{\left(\frac{M_{i,t+1+j}}{P_{t+j}} \right)^{1-\zeta} - 1}{1-\zeta} \right) \right]$$

with respect to

$$\begin{aligned} & P_t c_{i,t} + J_t (q_{i,t+1} - (1 - \delta) q_{i,t}) + M_{i,t+1} \\ & = \\ & (1 - \tau_t) W_t e_{i,t} + \mu (1 - \tau_t) W_t (1 - e_{i,t}) + D_t q_{i,t} + M_{i,t} \\ & \text{and} \\ & q_{i,t+1} \geq 0 \end{aligned}$$

First-order conditions

$$\frac{J_t}{P_t} = \beta \mathbb{E}_t \left[\left(\frac{c_{i,t+1}}{c_{i,t}} \right)^{-\gamma} \left(\frac{D_{t+1}}{P_{t+1}} + (1 - \delta) \frac{J_{t+1}}{P_{t+1}} \right) \right]$$

$$c_{i,t}^{-\gamma} = \beta \mathbb{E}_t \left[\frac{P_t}{P_{t+1}} c_{i,t+1}^{-\gamma} \right] + \chi \left(\frac{M_{i,t}}{P_t} \right)^{-\zeta}$$

- Marked departure from literature: Individual MRS is used in **both** Euler equations
- Inequality constraints ignored here

Equity market equilibrium

$$\begin{aligned}
 \underbrace{h_t}_{\text{Equity creation}} &+ \int_{i \in \mathcal{A}_-} \underbrace{\left((1 - \delta) q_i - q(e_i, q_i, M_i; s_t) \right)}_{\text{Equity sold}} dF_t(e_i, q_i, M_i) \\
 &= \int_{i \in \mathcal{A}_+} \underbrace{\left(q(e_i, q_i, M_i; s_t) - (1 - \delta) q_i \right)}_{\text{Equity bought}} dF_t(e_i, q_i, M_i),
 \end{aligned}$$

with

$$\mathcal{A}_- = \{i : q(e_i, q_i, M_i; s_t) - (1 - \delta)q_i \leq 0\},$$

$$\mathcal{A}_+ = \{i : q(e_i, q_i, M_i; s_t) - (1 - \delta)q_i \geq 0\},$$

"go to equity supply derivation"

Employment

$$\begin{aligned}q_t &= \int_{i \in \mathcal{A}_+} q(e_i, q_i, M_i; s_t) dF_t(e_i, q_i, M_i) \\ &\quad + \int_{i \in \mathcal{A}_-} q(e_i, q_i, M_i; s_t) dF_t(e_i, q_i, M_i) \\ &= (1 - \delta) q_{t-1} + h_t\end{aligned}$$

Money market equilibrium

- Equilibrium

$$\int_{i \in \mathcal{B}_-} \underbrace{(M_i - M(e_i, q_i, M_i; s_t))}_{\text{Money sold}} dF_t(e_i, q_i, M_i)$$

$$= \int_{i \in \mathcal{B}_+} \underbrace{(M(e_i, q_i, M_i; s_t) - M_i)}_{\text{Money bought}} dF_t(e_i, q_i, M_i),$$

- Money supply, \bar{M} , is constant in the benchmark economy.

Government

$$\tau_t q_t W_t = (1 - q_t) \mu (1 - \tau_t) W_t$$

$$\tau_t = \mu \frac{(1 - q_t)}{q_t + \mu (1 - q_t)}$$

Calibration

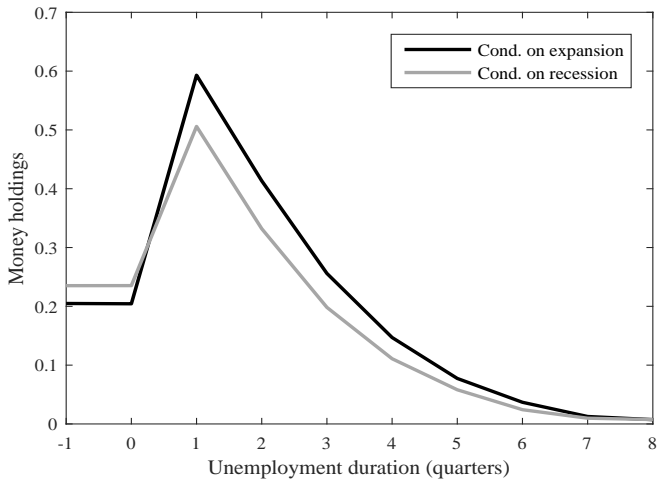
- ω_P : range of values

$$W_t = \omega_0 \left(\frac{z_t}{\bar{z}} \right)^{\omega_z} \bar{z} \left(\frac{P_t}{\bar{P}} \right)^{\omega_P} \bar{P}$$

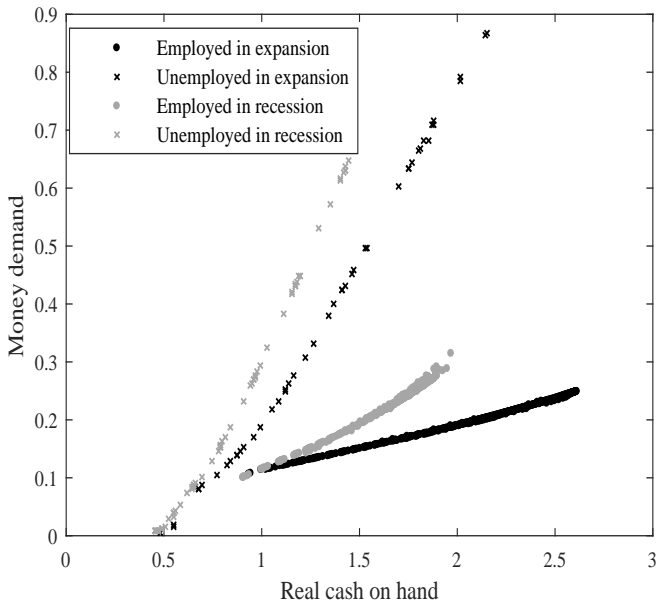
- One-year post-displacement consumption drop is 34% (Kolsrud, Landais, Nilsson, & Spinnewijn 2015; Sweden)
- Expected unemployment duration 3.57 quarters

MODEL PROPERTIES

Money holdings upon displacement



Amount invested in liquid asset



BUSINESS CYCLES

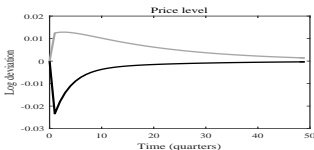
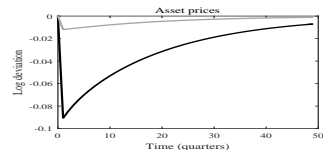
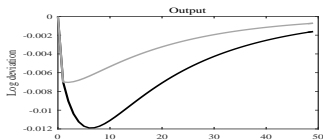
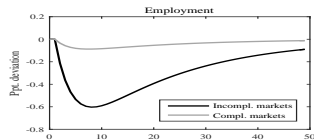
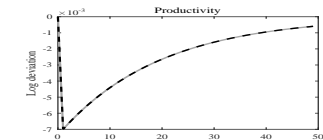
Type of experiment considered

- productivity $z_t \downarrow$

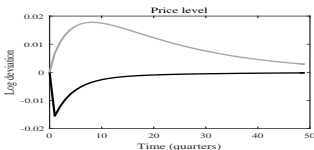
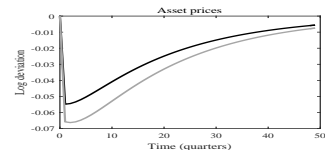
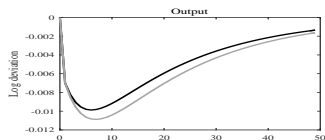
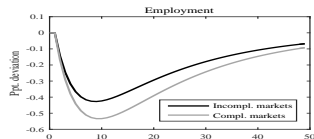
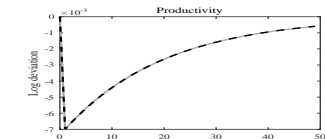
Representative-agent version:

- $P_t \uparrow \implies$
- $dW/dP \downarrow \implies$
- nominal-wage stickyness *dampens* shocks

IRFs with sticky nominal wages



IRFs with flexible nominal wages



UNEMPLOYMENT INSURANCE

Unemployment Insurance

Two unemployment insurance (UI) experiments

- 1 Compare economies with different replacement rates
- 2 Unexpectedly increase replacement rate and take into account transition

Two ways to deal with effect on wages

- 1 wage rule not affected
- 2 wage rule is adjusted to keep same implied Nash bargaining weights

Unemployment insurance

Mechanism emphasized in the literature

Replacement rate $\uparrow \implies$

- 1 Agents better insured \implies savings $\downarrow \implies$ employment \downarrow
- 2 Through bargaining wage $\uparrow \implies$ employment \downarrow

This also happens in our model too, but ...

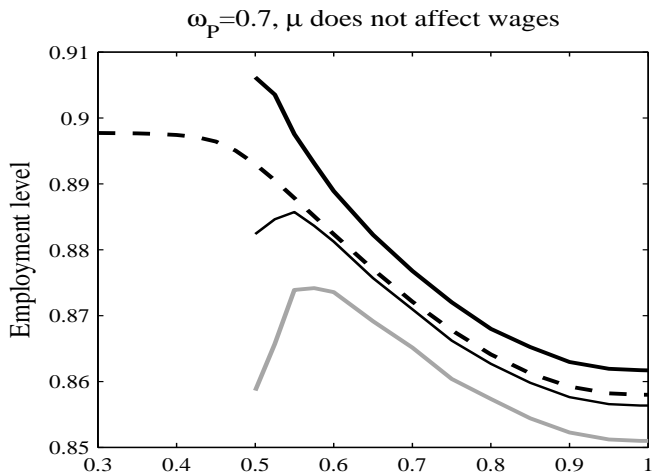
Mean employment rate and higher UI

... there is a strong countervailing effect arising from aggregate uncertainty:

Replacement rate $\uparrow \implies$

- ① Asset prices less volatile \implies demand equity $\uparrow \implies$ employment \uparrow
- ② Employment is concave in equity prices, $J \implies \mathbb{E}[\text{employment}] \uparrow$ when $\text{SID}[J] \downarrow$

UI and employment

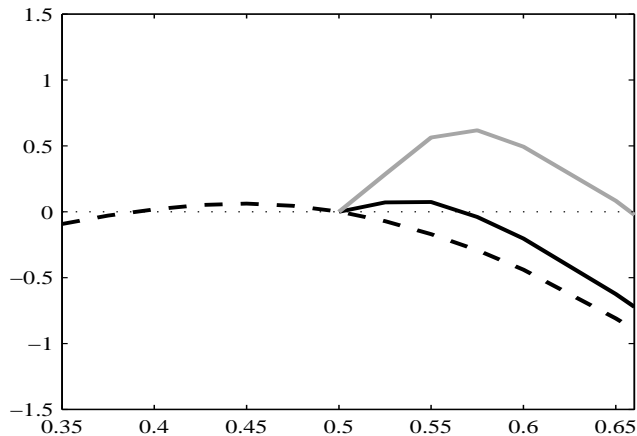


Switch to alternative UI policy

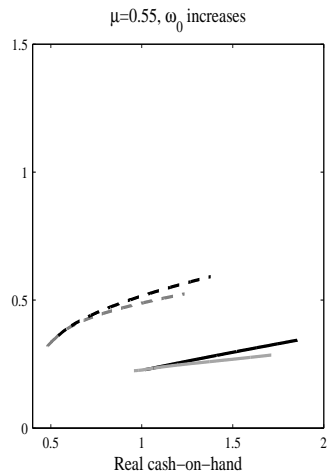
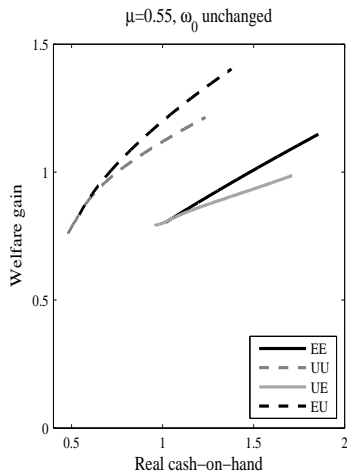
- ➊ Replacement rate increases from 0.5 to 0.55
- ➋ Switch is unexpected
- ➌ Switch is permanent
- ➍ Agents take transition into account

Average welfare effect of change in UI

$\omega_p=0.7$, μ affects wages



Who likes/dislikes higher UI?



Concluding comments

- With incomplete markets **and** sticky nominal wages, a decline in productivity sets off a self-reinforcing aggregate demand effect
- This happens despite the fact that both incomplete markets as well as sticky nominal wages – in isolation – repress propagation.
- One of the core components of this mechanism is the missing market for unemployment insurance.
- A rise in UI generosity can therefore increase average employment and raise welfare for all agents – even the asset-rich employed

Creation of new jobs/firms/equity

- number of new firms created:

$$h_t = \psi v_t^\eta u_t^{1-\eta}$$

- vacancy yield:

$$\frac{h_t}{v_t} = \psi \left(\frac{v_t}{u_t} \right)^{\eta-1}$$

Supply of new equity

- Matching function
- zero-profit condition



$$h_t = \psi \left(\frac{\psi J_t}{\kappa P_t} \right)^{\eta/(1-\eta)} u_t$$

Creation of new jobs/firms/equity

- zero-profit condition \implies vacancies as a function of J_t/P_t :

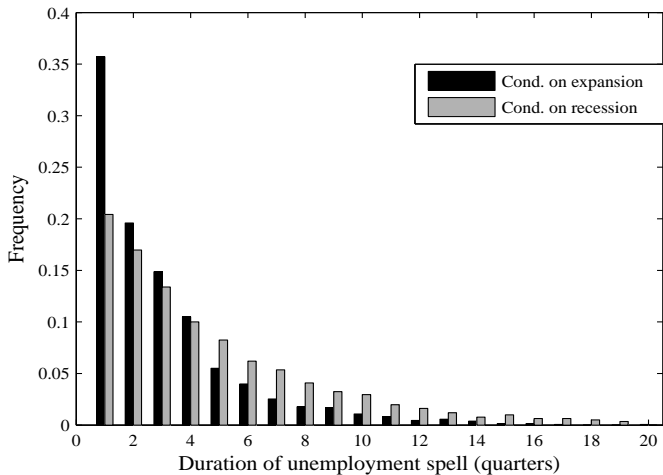
$$\kappa = \psi \left(\frac{v_t}{u_t} \right)^{\eta-1} \frac{J_t}{P_t}$$

- supply of *new* equity (job/firm creation):

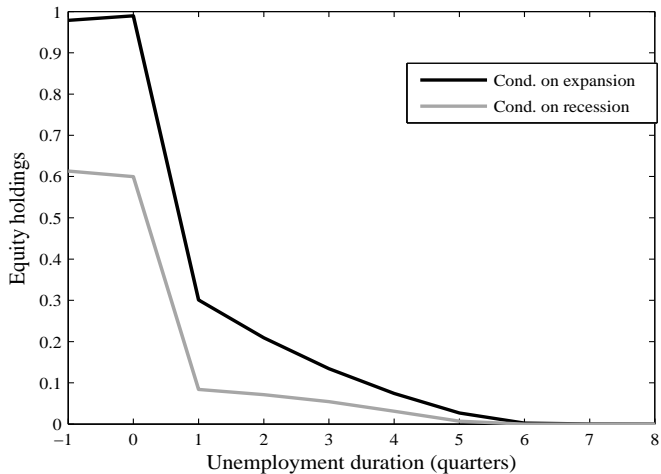
$$h_t = \psi \left(\frac{\psi J_t}{\kappa P_t} \right)^{\eta/(1-\eta)} u_t$$

"back to main"

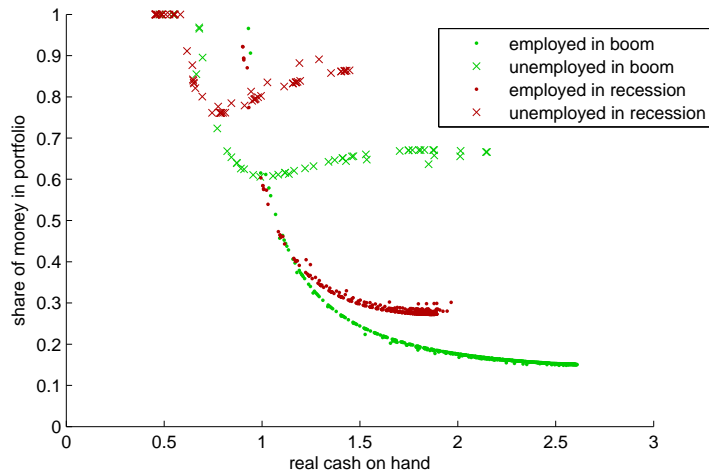
Unemployment duration



Equity holdings upon displacement



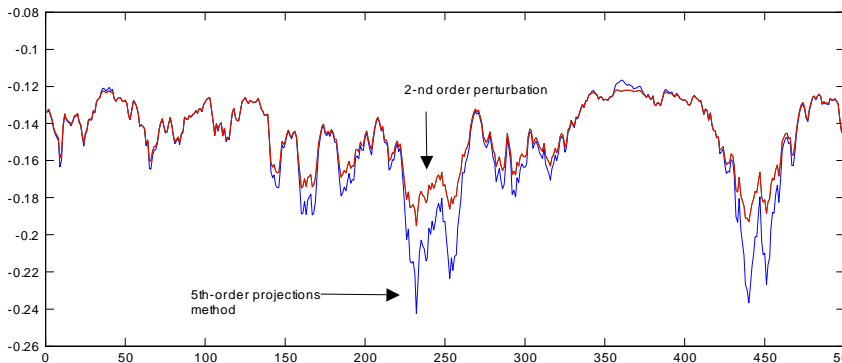
Portfolio choice: fraction in liquid asset



Technical challenges

- Even rep-agent version not trivial to solve accurately
 - non-linearity matching function matters
 - sufficiently volatile employment \implies
 - volatile surplus
 - volatile equity prices
 - *"go to accuracy graph rep-agent model"*
- Adding moderate aggregate uncertainty to model is *not* a small change
 - substantial changes in means
 - volatile surplus and asset prices
 - multiplicity

Log employment level



"back to main"

Increase in UI & transition dynamics

- Increase in UI first period of recession
- No change in wage rule \implies
 - equity less risky \implies average employment \uparrow
 - less deflationary spiral \implies recession less deep
 \implies employment \uparrow
- Change in wage rule \implies
 - the same as above +
 - profits $\downarrow \implies$ average employment \downarrow

Switch to higher level of unemployment benefits

