Unemployment (Fears), Precautionary Savings, and Aggregate Demand

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Overview

- Heterogeneous agents:
  - influence of precautionary savings on employment
  - role of nominal wage rigidity
  - correctly discounting profits
Overview

1 Model
   • interaction between goods and labor market
   • precautionary savings could end up in productive investment

2 Model properties
   • fear of unemployment
     • dampens downturn when nominal wages are not sticky
     • exacerbates downturn when nominal wages are sticky
Model: Key ingredients

1. Search frictions in labor market
2. Heterogeneous agents and incomplete markets
3. (Some) nominal wage stickiness
Individual agent

unemployed and employed agents

- unemployed search for work
- employed get nominal wage $W_t$
- exogenous job loss probability, $\rho_x$
- agents can invest in
  - money, $M_{i,t}$
  - firm ownership (equity), $q_{i,t}$
Individual agent

\[
\max \sum \beta^t \left[ u(c_{i,t}) + v\left( \frac{M_{i,t}}{P_t} \right) \right]
\]

Budget constraint:

\[
P_t c_{i,t} + J_t q_{i,t} + M_{i,t} = e_{i,t} W_t + (1 - e_{i,t}) U_t + q_{i,t-1} (D_t + (1 - \rho_x) J_t) + M_{i,t-1}
\]

\[q_{i,t} \geq 0\]
First-order conditions

Money:

\[ c_{i,t}^{-\nu} = \beta E_t \left[ \frac{P_t}{P_{t+1}} c_{i,t+1}^{-\nu} \right] + \zeta_0 \left( \frac{M_{i,t}}{P_t} \right)^{-\zeta_1} \]

Equity, if \( q_{i,t} > 0 \):

\[ \frac{J_t}{P_t} = \beta E_t \left[ \left( \frac{c_{i,t+1}}{c_{i,t}} \right)^{-\nu} \left( \frac{D_{t+1}}{P_{t+1}} + (1 - \rho_x) \frac{J_{t+1}}{P_{t+1}} \right) \right] \]
Policy functions

- $q$ employed
- $q$ unemployed
- $m$ employed
- $m$ unemployed

Graph showing the relationship between cash on hand and the proportion of employed and unemployed individuals.
Job/Firm creation

Standard free-entry condition:

\[ P_t \psi = \pi_{f,t} I_t \]

\[ \pi_{f,t} = \phi_o \left( \frac{\nu_t}{1 - n_{t-1}} \right)^{\phi_1 - 1} \]

\[ n_t = (1 - \rho_x) n_{t-1} + \phi_o \nu_t^{\phi_1} (1 - n_{t-1})^{1 - \phi_1} \]
Existing firm

\[ D_t = P_{tz_t} - W_t \]
Wage setting

\[ W_t = \omega_0 z_t^{\omega_1} p_t^{\omega_2} \]

- \( \omega_1 < 1 \): sticky real wages
- \( \omega_2 < 1 \): sticky nominal wages
Equilibrium

- demand for money = (constant) money supply
- demand for firm ownership = number of firms
Correctly dealing with firm value:

\[
\frac{J_t}{P_t} = \mathbb{E}_t \left[ MRS_{i,t+1} \left( \frac{D_{t+1}}{P_{t+1}} + (1 - \rho_x) \frac{J_{t+1}}{P_{t+1}} \right) \right]
\]

Which \( MRS_{i,t+1} \) to use?
Firm value

\[
\frac{J_t}{P_t} \approx E_t \left[ MRS_{i,t+1} \left( \frac{D_{t+1}}{P_{t+1}} + (1 - \rho_x) \frac{J_{t+1}}{P_{t+1}} \right) \right]
\]

Literature:

- representative agent: \( MRS_{t+1} = \beta \left( \frac{c_{t+1}}{c_t} \right)^{-\nu} \)
- heterogeneous agents:
  - Krusell, Mukoyama, Sahin (2010): two assets and two outcomes for aggregate state \( \implies \) use prices of the two Arrow-Debreu securities
  - dinky "solution": assume risk neutral firm manager, which is inconsistent with risk averse firm owners

This paper: Get \( J(\cdot) \) by imposing equilibrium
Solving for firm value

\[ J_t = J(s_t) \]

- solve for \( J(s_t) \) by imposing equilibrium

\[ \int_i q_{i,t} di = n_t \]

- LHS: demand for firm ownership from individual problem
- RHS: supply of firm ownership comes from free-entry condition
State variables

- Individual state variables
  - cash on hand: $q_{t-1} (D_t + (1 - \rho_x) J_t) + M_{i,t-1}$
  - employment status

- Aggregate state variables
  - aggregate productivity
  - number of firms = equity shares
Precautionary savings

How to get precautionary savings in a model?

- typically done through $\Delta \beta$
- this paper through $\Delta$unemployment
Typical precautionary savings story

Households want to save more

- $\implies$ demand for consumption $\downarrow$ & prices do not adjust
- $\implies$ demand for labor $\downarrow$, etc.

Where do savings end up?

- typically not allowed to end up in investment because
  - there is no physical investment
  - or incorrect discounting of firm profits
Precautionary savings in this paper

We do have something like the standard channel:

- unemployment $\uparrow \implies$ demand for money $\uparrow$
- $\implies P_t \downarrow \implies$ real profits $\downarrow$ (because of sticky nominal wages)
- $\implies$ firm/job creation $\downarrow$

- but in this paper !!!
Precautionary savings in this paper

We do have something like the standard channel:

• unemployment ↑ ⟷ demand for money ↑
• $P_t \downarrow \rightarrow$ real profits ↓ (because of sticky nominal wages)
• $\rightarrow$ firm/job creation ↓

• but in this paper !!!
• precautionary savings could end up in productive investment since $MRS_{i,t} \uparrow$ when precautionary savings ↑
Precautionary savings and productive investment

- This paper: investment in firm/job creation *could* ↑ when precautionary savings ↑

Reasons why it *could* ↓:

- agents less willing to hold firm equity when profits ↓
- agents less willing to hold risky assets when unemployment ↑
Model properties

1. Model 1: no nominal wage stickiness
   \[ W_t = \omega_0 z_t^{0.3} P_t \]
   Precautionary savings *dampen* downturn

2. Model 2: with nominal wage stickiness
   \[ W_t = \omega_0 z_t^{0.3} P_t^{0.85} \]
   Precautionary savings *worsen* downturn
No nominal wage stickiness

- productivity $\downarrow$
- $\implies$ profits $\downarrow$ $\implies$ firm value $\downarrow$ $\implies$ unemployment $\uparrow$
- $\implies$ precautionary savings $\uparrow$
  - $\implies$ demand for firm ownership may $\uparrow$ $\implies$ unemployment $\downarrow$
  - $\implies$ demand for money $\uparrow$ $\implies$ $P \downarrow \not\Rightarrow \Delta$ profits since nominal wages adjust
No nominal wage stickiness

Productivity $z$
No nominal wage stickiness

Precautionary demand for $\mathcal{M}$ makes price procyclical!
No nominal wage stickiness

Precautionary savings has small upward effect on firm value for low $z$. 
No nominal wage stickiness

Precautionary savings has small upward effect on employment for low $z$. 
With nominal wage stickiness

- productivity ↓
- \( \rightarrow \) profits ↓ \( \rightarrow \) firm value ↓ \( \rightarrow \) unemployment ↑
- \( \rightarrow \) precautionary savings ↑
  - \( \rightarrow \) demand for firm ownership may ↑ \( \rightarrow \) unemployment ↓
  - \( \rightarrow \) demand for money ↑ \( \rightarrow \) \( P \) ↓ \( \rightarrow \) profits ↓ \( \rightarrow \) unemployment ↑ \( \rightarrow \) downward spiral
With nominal wage stickiness

Precautionary demand for $M$ makes price procyclical!
With nominal wage stickiness

Firm value strongly reduced in a downturn
With nominal wage stickiness

Employment strongly reduced in a downturn
Role of nominal wage stickiness

Change from boom to recession for representative agent (red) vs heterogeneous agents (blue)