Uninsured Unemployment Risk and Optimal Monetary Policy

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ASSA 2018
Low consumption

Strong precautionary motive

Low output

High unemployment

Bad aggregate shock

Basic questions

- how should the central bank respond to this feedback loop?
- how much does this response differ from that under full insurance?
- how well does the optimal policy stabilise welfare-relevant aggregates (relative to full-insurance benchmark)?
Framework and main results

- tractable HANK model with endogenous unemployment

- focus on (transitory, persistent) productivity & cost-push shocks

- monetary policy should be (much) more accommodative in recessions (and less in expansions) than under full insurance

- policy rate should typically be lowered after productivity or cost-push driven recessions (opposite as in RANK)

- This is because monetary policy should counter the rise in desired savings due to the precautionary motive

- optimal policy almost fully neutralises feedback loop between aggregate demand and unemployment risk
Model overview

- 2 household types: workers, firm owners
- 3 firm types (final, wholesale, intermediate goods)
- government:
  - sets (lump sum, constant) taxes and transfers
  - balanced budget
- central bank: sets policy rate

<table>
<thead>
<tr>
<th>Firms</th>
<th>Frictions</th>
<th>Taxes</th>
</tr>
</thead>
</table>
| household labour ⇒ intermediate goods ↓
  differentiated wholesale goods ↓
| costly search | monopolistic comp. & Calvo pricing (\(p_t^*, \pi_t, \Delta_t\)) | \(\tau^l, T, \zeta_t\) \(\tau^W\) |
| consumption & vacancy costs ↔ final goods |
Households

- discount factor $\beta$, nonnegative asset wealth

- **workers**: period utility $u(c)$ ($u' > 0$, $u'' < 0$) and constraints:

  $$a_{i,t} + c_{i,t} = e_{i,t} w_t + (1 - e_{i,t}) \delta + R_t a_{i,t-1} \quad \text{and} \quad a_{i,t} \geq 0$$

- **firm owners**: period utility $\tilde{u}(c)$ ($\tilde{u}' > 0$, $\tilde{u}'' \leq 0$) and constraints:

  $$a_t^F + c_t^F = \frac{D_t + \omega + \tau_t}{\nu} + R_t a_{t-1}^F \quad \text{and} \quad a_t^F \geq 0$$

- only workers have a precautionary motive

- $a =$ real value of nominal bond holdings; hence $R_t = \frac{1 + i_{t-1}}{1 + \pi_t}$
Intermediate goods firms and labor market flows

- job creation/destruction a la DMP, with matching technology

\[ M_t = m (1 - (1 - \rho) n_t) \gamma v_t^{1-\gamma} \]

- free-entry \( c = \lambda_t J_t \), where

\[ J_t = (1 - \tau^I) (z_t \varphi_t - w_t + T - \zeta_t) + (1 - \rho) \mathbb{E}_t M_{t+1}^F J_{t+1} \]

flow profit from employ. relationship

- equivalently:

\[ f_t^{\frac{\gamma}{1-\gamma}} = (1 - \tau^I) \frac{m^{\frac{1}{1-\gamma}}}{c} (z_t \varphi_t - w_t + T - \zeta_t) + (1 - \rho) \mathbb{E}_t M_{t+1}^F f_{t+1}^{\frac{\gamma}{1-\gamma}} \]
Equilibrium

- optimal choices consistent with market-clearing + free entry

- zero debt limit $\Rightarrow$ equilibrium wo. asset trades

- with common $\beta$, eq’m such that
  - employed workers precautionary-save, hence take down $R_t$
  - at that rate, the other households would like to borrow, but cannot
  - thus all households consume their current income

- preserves precautionary motive whilst maintaining tractability

- allows aggregation of ind. welfares into social welfare function
Constrained efficiency

Social welfare function

- constrained-efficient allocation solves:

$$W_t (n_{t-1}, \Delta_{t-1}, z_t) = \max_{p_t^*, w_t, n_t \geq 0} \{ U_t + \beta \mathbb{E}_t W_{t+1} (n_t, \Delta_t, z_{t+1}) \} ,$$

where

$$U_t = n_t u(w_t) + (1 - n_t) u(\delta) + \Lambda \nu \tilde{u} \left( \frac{1}{\nu} \left[ \omega + n_t \left( \frac{z_t}{\Delta_t} - w_t \right) - cv_t \right] \right)$$

- 5 potential inefficiencies:
  1. monopolistic competition ($\Rightarrow \tau^W > 0$)
  2. relative price distortions ($\Rightarrow \pi_t^* = 0$)
  3. congestion externalities ($\Rightarrow \tau^I > 0$)
  4. imperfect insurance ($\Rightarrow T > 0$)
  5. income-redistributive wage $\Rightarrow$

$$u'(w_t^*) = \Lambda \tilde{u}' \left( v^{-1} [n_t^* (z_t - w_t^*) - cv_t^* + \omega] \right)$$
Constrained efficiency

Details

Constrained-efficient $f_t^*$ vs decentralised-eq’m $f_t$:

$$f_t^\frac{\gamma}{1-\gamma} = \frac{(1 - \gamma) m^{\frac{1}{1-\gamma}}}{c} \left[ z_t - w^* + \frac{u(w_t^*) - u(\delta)}{u'(w_t^*)} \right] + (1 - \rho) \mathbb{E}_t M^F_{t+1} f_{t+1}^\frac{\gamma}{1-\gamma} (1 - \gamma f_{t+1}^*)$$

$$f_t^{\frac{\gamma}{1-\gamma}} = \frac{(1 - \tau^I) m^{\frac{1}{1-\gamma}}}{c} \left[ z_t \varphi_t - w_t + T - \zeta_t \right] + (1 - \rho) \mathbb{E}_t M^F_{t+1} f_{t+1}^\frac{\gamma}{1-\gamma}$$

- $\frac{u(w^*) - u(\delta)}{u'(w^*)}$ reflects insurance externality and calls for $T > 0$
- $1 - \gamma$ & $1 - \gamma f_{t+1}^*$ reflect congestion externalities and call for $\tau^I > 0$
- $\varphi_t \ (\leq 1)$ reflects monopolistic distortions and calls for $\tau^W > 0$
- Assume taxes decentralise constr.-efficient allocation in steady state
Full worker reallocation + risk-neutral firm owners

Linear-quadratic problem

- $\rho = 1$ and $\tilde{u}(c) = c$; then, to 2nd order $\max W_t$ is equivalent to:

$$
\min L_t = \frac{1}{2} E_t \sum_{k=0}^{\infty} \beta^k (\tilde{n}^2_{t+k} + \Omega \pi^2_{t+k}), \quad \tilde{n}_t \equiv \underbrace{\hat{n}_t - \hat{n}^*_t}_{\text{employment gap}}
$$

s.t.

$$
\pi_t = \beta E_t \pi_{t+1} + \frac{\kappa}{\Phi} \tilde{n}_t + \kappa \hat{\zeta}_t \quad \text{(NKPC)}
$$

$$
\Psi E_t \tilde{n}_{t+1} = \hat{\pi}_t - E_t \pi_{t+1} - r_t^* \quad \text{(EC)}
$$

where

$$
r_t^* = \Psi \Phi \mu_z \hat{z}_t
$$

- EC reflects precautionary motive, with strength $\Psi \in (0, +\infty)$

- efficient rate $r_t^*$ is affected by precautionary motive
Full worker reallocation + risk-neutral firm owners

Optimal Ramsey policy

\[ i_0(\hat{z}_0, \hat{\zeta}_0) = Y(\alpha + \mu_{\zeta} - 1)\hat{\zeta}_0 - \Psi Y\theta n(\alpha + \mu_{\zeta})\hat{\zeta}_0 + \Psi \Phi \mu_z \hat{z}_0, \]

\[ \text{perfect-insurance response} \quad \text{imperfect-insurance correction} \]

and

\[ i_{t\geq 1}(\hat{z}_0, \hat{\zeta}_0) = Y[\mu_{\zeta}^t - (1 - \alpha) \sum_{k=0}^{t} \alpha^k \mu_{\zeta}^{t-k}]\hat{\zeta}_0 \]

\[ \text{perfect-insurance response} \]

\[ - \Psi Y\theta n[\sum_{k=0}^{t} \alpha^k \mu_{\zeta}^{t-k}]\hat{\zeta}_0 + \Psi \Phi \mu_z^{t+1} \hat{z}_0 \]

\[ \text{imperfect-insurance correction} \]

- imperfect insurance **mutes down / reverts** interest-rate response

- implied \( \{\tilde{n}_t, \pi_t\}_{t=0}^{\infty} \) is the **same as under perfect insurance**
Full worker reallocation + risk-neutral firm owners

Optimal discretionary policy

\[ \hat{i}_t(\hat{z}_0, \hat{\zeta}_0) = \left( \frac{\kappa \Phi \mu_{\zeta}^{t+1}}{(1 - \beta \mu_{\zeta}) \Phi + \kappa \theta n} \right) \hat{\zeta}_0 \]

perfect-insurance response

\[ - \Psi \left( \frac{\kappa \Phi \theta n \mu_{\zeta}^{t+1}}{(1 - \beta \mu_{\zeta}) \Phi + \theta n \kappa} \right) \hat{\zeta}_0 + \Psi \Phi \mu_{\zeta}^{t+1} z_0 \]

imperfect-insurance correction

- more accommodation + replication of perfect-insurance dynamics
Partial worker reallocation + risk-averse firm owners

- solve Ramsey problem numerically for calibrated economy

- baseline: efficient wage with $\sigma = 1, \bar{\sigma} = 0.38 \Rightarrow \frac{d \log w}{d \log z} = 1/3$

Calibration.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Description</th>
<th>Value</th>
<th>Targets</th>
<th>Eq.</th>
<th>Description</th>
<th>Value</th>
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<tbody>
<tr>
<td>$\beta$</td>
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<td>$4i$</td>
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<td>$\theta$</td>
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<td>$s$</td>
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<td></td>
<td>$\frac{\delta}{w^*}$</td>
<td>Opp. cost of empl.</td>
</tr>
</tbody>
</table>
Figure: Contractionary productivity shock (imperfect vs. perfect insurance).
Figure: Contractionary cost-push shock (imperfect vs perfect insurance).
**Figure:** Contractionary productivity shock (alternative wage settings).
**Figure:** Contractionary cost-push shock (alternative wage settings).
Summary

- optimal monetary policy in NK model with endogenous unemployment risk (⇒ amplification through feedback loop)

- replicates RANK predictions under perfect insurance

- but policy should be much more accommodative under imperfect insurance – hence RANK predictions may be overturned

- optimal policy (almost) replicates perfect-insurance dynamics

- incomplete markets “do not matter” when monetary policy is unconstrained and optimised

- robust to various model variants
  - plausible wage responses
  - distorted steady state
  - degree of insurance