Optimal Unemployment Insurance
and Cyclical Fluctuations

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In normal times, unemployment benefits typically provide replacement rate (47% average) for 26 weeks.

In recessions, federal extended benefits provide an additional 13 weeks of benefits. In severe recessions, these are extended further: up to 99 weeks in high unemployment states recently.

What should be the optimal pattern (level, duration) of unemployment insurance over the cycle when workers put forth unobservable search effort?

How would this affect outcomes? Level and duration of unemployment in booms and recessions. Tradeoff increased insurance with less information in a recession.
What We Do

- Study optimal unemployment insurance contracts with moral hazard due to unobservable search effort.
- Continuous time version of Hopenhayn-Nicolini (1997), with business cycles and multiple unemployment spells.
- Consider exponential utility and cost case that can be solved explicitly.
- Show how to implement optimal contract via simple instruments.
- In a calibrated version of the model, switching from current system to optimal reduces unemployment rates 2.5% points in recessions, cuts durations by 50%, less cyclicality.
- Extending benefits has small impact on current system, but replacing system has large impact.
The Model

- All jobs pay wage $\omega$. Exogenous separations.
- Workers are risk averse, put forth search effort $a$, consume $c$. No outside consumption when unemployed.

$$\max_{\hat{a} \in A} E^{\hat{a}} \left[ \rho \int_0^\infty e^{-\rho t} u(c_t, \hat{a}_t) dt \right]$$ (1)

- Unemployment agency minimizes transfers $b_t$ s.t. to providing given utility, incentive constraint. Note $b_t = c_t$ in unemp, $b_t = c_t - \omega$ when employed. Allow risk averse.

$$\max_{(c, a) \in C} E^a \left[ -\rho \int_0^\infty e^{-\rho t} v(b_t) dt \right]$$

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Business cycle: boom is a period of high job finding rates, low unemployment rates.

- Business cycle state: \( s_t \in \{ G, B \} \).
- Poisson arrival intensity of a job is:
  \[ q_s(a_t) = q_{s0} + q_s a_t, \quad q_B(a) < q_G(a) \]
- Exogenous separation intensity: \( p_B > p_G \)
- Aggregate state intensity: \( \lambda_B > \lambda_G \).
Solve for optimal contracts recursively, with promised utility $W$ as state variable. Maximize agency utility subject to incentive constraint.

First order approach valid, simplifies incentive constraint.

Typically require numerical methods, but special case with exponential utility and cost is solvable.

$$u(c, a) = -\exp(-\theta_A(c - h(a))), \quad v(c) = \exp(\theta_P c)$$

Permanent jobs $p_s = 0$. Linear finding: $q_s(a) = q_s a$.

Employed worker value then independent of agg state.

Unemployed search effort is state-dependent but independent of $W$: $a = a^*(s)$.

Proportional utility adjustment when find a job $W' = w_J(s) W$ or state switches $W' = w_S(s) W$. 
Comparative Statics: Severity of Business Cycle $q_G - q_B$

Effort: $a^*(s)$.
Comparative Statics: Severity of Business Cycle $q_G - q_B$

Consumption constants: $c^*(s) + h(a^*(s))$. 

![Graph showing the relationship between $q_G - q_B$ and consumption constants $c^*(s) + h(a^*(s))$. The graph demonstrates how the severity of business cycles affects consumption constants.]
Implementing the Optimal Contract

- So far direct implementation, specifying consumption as a function of promised utility. Tie promised utility to wealth.
- Now consider agent consumption-savings-effort problem. Wealth when employed:

  \[ dx_t = [\rho x_t - c_t + b^e] dt. \]

  \( \rho \) interest rate, \( b^e \) after-tax wage: both constant

- Unemployed wealth, jumps when find job or state switches:

  \[ dx_t = [r(s_t)x_t - c_t + b^u(s_t)] dt + B(s_t) \Delta s_t^J + A(s_t, x_t) \Delta s_t^S. \]

  state-dependent interest rate \( r(s) \), benefit \( b^u(s) \), payment on switch of job \( B(s) \) or state \( A(s, x) \)
The Implementation

- The policy that implements the contract:

\[ r(s) = -\rho u(c^*(s)) \]
\[ b^u(s) = -\frac{\mu W(s)}{r(s)\theta_A} - \frac{1}{\theta_A} \log \frac{r(s)}{\rho} + h(a^*(s)) \]
\[ B(s) = -\frac{\log(w_J(s_t))}{r(s_t)\theta_A} \]
\[ A(s, x) = \left( \frac{r(s)}{r(s')} - 1 \right) x - \frac{\log(w_S(s))}{r(s')\theta_A} \]

- Unemployment savings accounts: Feldstein and Altman (2007)
- Payment on change of aggregate state
Comparative Statics: Severity of Business Cycle $q_G - q_B$

Interest rate: $r(s)$.
Re-employment bonus: $B(s)$.
A Quantitative Example

- Analyze quantitative impact of unemployment insurance reform in a calibrated model.
- Reintroduce separations and multiple unemployment spells.
- Agency risk neutral $v(c) = c$, workers have separable power utility:
  \[ u(c, a) = \frac{c^{1-\gamma}}{1-\gamma} - \frac{a^{1+\phi}}{1+\phi} \]
- Calibrate model under a stylized version of the current system ("benchmark contract"): fixed benefit at 47% of wages for 26 weeks in booms, 39 weeks in recessions.
- Match mean finding rates in boom, recession, elasticity of unemp duration w.r.t benefit
## Summary Statistics

<table>
<thead>
<tr>
<th></th>
<th>Benchmark</th>
<th></th>
<th>Optimal</th>
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<tbody>
<tr>
<td></td>
<td>Boom</td>
<td>Recess</td>
<td>Boom</td>
<td>Recess</td>
</tr>
<tr>
<td>Unemp. Rate (%)</td>
<td>5.33</td>
<td>6.57</td>
<td>3.60</td>
<td>4.00</td>
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<tr>
<td>Unemp. Duration (weeks)</td>
<td>6.21</td>
<td>7.33</td>
<td>4.44</td>
<td>4.67</td>
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<tr>
<td>Finding Rate (month)</td>
<td>0.49</td>
<td>0.41</td>
<td>0.64</td>
<td>0.61</td>
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<tr>
<td>Separation Rate (month)</td>
<td>0.033</td>
<td>0.035</td>
<td>0.033</td>
<td>0.035</td>
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<tr>
<td>Net Cost/Worker (% of $\omega$)</td>
<td>2.50</td>
<td>3.09</td>
<td>1.95</td>
<td>2.21</td>
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</tbody>
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Consumption Over Unemployment Spell: Recession

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Job Finding Rates Over Unemployment Spell: Recession
Recession and Extended Benefits

Simulate long recession and compare benefits extension. Benchmark: 5.3% ⇒ 6.7%, 99-Week: 5.3% ⇒ 6.8%. Optimal: 3.6% ⇒ 4.0%.

![Graph](https://via.placeholder.com/150)

- Benchmark Contract (39-Week Benefit)
- Benchmark Contract (99-Week Benefit)
- Optimal Contract
Conclusion

- Unemployment insurance should vary over business cycle: insurance/incentive tradeoff changes in boom/recession.
- We characterize optimal benefits provision over the cycle.
- Exponential utility and cost case solvable in closed form. Allows us to characterize features of contract.
- Optimal contract implementable via simple instruments, with some precedence in literature and practice.
- In calibrated model, unemployment relatively insensitive to benefit duration in current system.
- But large impact on unemployment of reform. Lower rates, shorter durations, less cyclicality.
Cyclical Job Finding and Unemployment Rates

Cyclical Job Finding Rate and (Scaled) Recession Indicator

Cyclical Unemployment Rate and (Scaled) Recession Indicator

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## Calibrated Parameter Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Target</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>$\lambda_G$</td>
<td>0.0173</td>
<td>Transition Prob</td>
<td>0.933</td>
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<tr>
<td>$\lambda_B$</td>
<td>0.0233</td>
<td>Transition Prob</td>
<td>0.911</td>
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<td>$q_G$</td>
<td>0.0038</td>
<td>Finding Rate</td>
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<td>$q_B$</td>
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<td>Finding Rate</td>
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<td>$\phi$</td>
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<td>Unemp elasticity</td>
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<td>$\gamma$</td>
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<td>Hopenhayn-Nicolini</td>
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<td>$\rho$</td>
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<td>Annual discount</td>
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<td>$\omega$</td>
<td>495</td>
<td>Median annual wage</td>
<td>25,737</td>
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Consumption over Unemployment Spell

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