Severance payments in an economy with frictions

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20 min presentation for Sargent's RG

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Environment

- A measure one of agents in every period
- Agents stochastically experience from active life to retirement and eventually to death.
  - active agents face exogenous retiring probability
  - retired agents face exogenous surviving probability
  - the probability of being employed depends on search intensity
- There is a technology to create new establishment using consumption good
- Initial productivity shocks for the new establishments are randomly drawn from a common distribution
- There is a firing penalty

Pref, Tech and Market Arrangements

Preference

- $E\sum_{t=0}^{\infty}\beta^t[\ln(c_t)+u(1-\eta_t)]$
- $u(1-\eta_t)=\alpha\frac{(1-\eta_t)^{\tau}-1}{\tau}$

Technology

- $y_t=s_tk^{\theta}n_t^{\gamma}$
- $K_{t+1}=(1-\delta)K_t+I_t$

Market Arrangement

- Agents can only save an interest-bearing asset
- Borrowing is not permitted

Establishment's problem

$$V(e,s) = \max_{n,k}\{sk^{\theta}n^{\gamma} - w^{*}n - rk - \Omega(e,n) + \frac{1}{1+i}\Sigma_{s'}V(n,s')Q(s,s')\} \tag{1}$$

$$\Omega(e,n) = \epsilon w^{*}\max\left[e(1-\rho) - n, 0\right] \tag{2}$$

Employed Agent's problem

$$N(a,e,s) = \max_{c,a'}\{\ln c + \beta\rho R(a')$$

$$+ \beta(1-\rho)\sum_{s'} N(a',e',s')\Lambda(e',s')Q(s,s')$$

$$+ \beta(1-\rho)\sum_{s'} U(a' + \frac{\lambda w}{1+i})[1-\Lambda(e',s')]Q(s,s')\} \qquad (3)$$

$$s.t \quad e' = n(e,s)$$

$$c + a' \leq (1+i)a + w$$

$$a' \geq 0$$

$$\Lambda(e,s) = \min\left\{1, \frac{n(e,s)}{(1-\rho)e}\right\}$$

Unemployed Agent's problem

$$U(a) = \max_{c,\eta,a'} \{\ln c + u(1-\eta) + \beta\rho R(a') + \beta(1-\rho)\eta^{\xi} \sum_{e',s'} N(a',e',s')\Gamma(e',s') + \beta(1-\rho)(1-\eta^{\xi})U(a')\} \quad (4)$$

$$s.t \quad c + a' \leq (1+i)a + w$$

$$a' \geq 0$$

$$\Gamma(e',s') = \frac{\max[0, n(e',s') - (1-\rho)e']x(e',s')}{\sum_{e,s} \max[0, n(e,s) - (1-\rho)e]x(e,s)}$$

Retired Agent's problem

$$R(a) = \max_{c,a'} \{\ln c + \beta\sigma R(a')\} \tag{5}$$

$$s.t \quad c + a' \leq (1+i)a + w$$

$$a' \geq 0$$

Government

$$0 = (w^* - w) \sum_{a,e,s} y^N(a,e,s)$$
$$+ [\epsilon w^* - \lambda w] \sum_{e,s} \max [0, (1-\rho)e - n(e,s)] x(e,s)\} \qquad (6)$$

A *Competitive Equilibrium* is a set of prices $\{i, r, w, w^*\}$; a set of functions $\{V, n, kN, g^N, U, g^U, \eta, R, g^R\}$, a set of time invariant measures $\{x, y^N, y^U, y^R\}$; a level of establishment creation ν, a distribution function Γ, and a probability function Λ such that the following conditions hold.

- Given i, r, w^*: V, n, k solve the establishment's problem.
- Given i, w, Λ, Γ: N, U, R, g^N, g^U, g^R, c^N, c^U, c^R, η solve the agent's problem.
- x, Γ and Λ are consistent with the individual decisions of establishments and the level of establishment creation ν.
- y^N, y^U, y^R consist with the agents' decisions.
- The government's budget constraint is satisfied.
- The asset, labor and goods markets clear.
- $r = i + \delta$ and $\mu = \frac{1}{1+i} \sum_{s'} V(0, s')\psi(s')$ hold

Calibration (1)

$$S = \{0,\ 1,\ \bar{s}\} \quad \psi = (0.5,\ 0.5)$$

$$\mathbf{Q} = \begin{pmatrix} 1 & 0 & 0 \\ \pi & \omega(1-\pi) & (1-\omega)(1-\pi) \\ \pi & (1-\omega)(1-\pi) & \omega(1-\pi) \end{pmatrix}$$

$$\omega = 0.973 \quad \pi = 0.037 \quad \bar{s} = 2.12$$

Calibration (2)

discount rate	β	0.99425
preference parameter	α	15.5
preference parameter	τ	0.98
search technology	ξ	0.98
retire probability	ρ	0.0031
surviving probability	δ	0.9917
capital share	θ	0.19
labor share	γ	0.58
establishments creating tech	μ	1950

Results (1)

Severance payments

Months of wages	U.S.	$\lambda = 0.0$ laissez-faire	$\lambda = 0.67$ 1 month	$\lambda = 2.0$ 3 months	$\lambda = 4.0$ 6 months	$\lambda = 8.0$ 12 months
Job-finding rate	51.7%	61.0%	61.4%	62.1%	63.8%	70.5%
Layoff rate	2.8%	2.9%	2.8%	2.8%	2.6%	2.1%
Unemployment rate	5.7%	4.9%	4.8%	4.7%	4.3%	3.2%
Employment	99.2	100.0	100.1	100.2	100.6	101.7
Output	99.2	100.0	100.2	100.5	100.7	99.5
Capital	99.3	100.0	100.3	100.8	101.5	101.5
Assets	99.0	100.0	99.7	99.0	98.0	94.2
Consumption	99.2	100.0	100.1	100.2	100.3	98.7
S.D. consumption	99.1	100.0	100.2	100.7	101.5	102.1
Non-search time	100.0	100.0	100.0	100.1	100.2	100.5
Welfare	99.6	100.0	100.2	100.7	101.6	103.7

Results (2)

Firing taxes rebated as employment subsidies (exogenous job-finding rate)

Months of wages	$\varepsilon = 0.0$ laissez-faire	$\varepsilon = 0.67$ 1 month	$\varepsilon = 2.0$ 3 months	$\varepsilon = 4.0$ 6 months	$\varepsilon = 8.0$ 12 months
Job-finding rate	61.0%	61.0%	61.0%	61.0%	61.0%
Layoff rate	2.9%	2.8%	2.8%	2.6%	2.0%
Unemployment rate	4.9%	4.9%	4.7%	4.5%	3.7%
Interest rate	4.0%	4.0%	4.0%	3.9%	3.8%
Employment	100.0	100.1	100.1	100.4	101.3
Output	100.0	100.2	100.4	100.6	98.9
Capital	100.0	100.3	100.8	101.4	100.7
Assets	100.0	99.7	99.1	97.9	93.3
Consumption	100.0	100.1	100.3	100.2	98.3
S.D. consumption	100.0	100.2	100.7	101.1	100.0
Welfare: no search disutility	100.0	100.0	99.7	99.2	96.1
Welfare	100.0	100.3	100.8	101.8	104.1

Results (3)

Firing taxes rebated as employment subsidies (endogenous job-finding rate)

Months of wages	$\varepsilon = 0.0$ laissez-faire	$\varepsilon = 0.67$ 1 month	$\varepsilon = 2.0$ 3 months	$\varepsilon = 4.0$ 6 months	$\varepsilon = 8.0$ 12 months
Job-finding rate	61.0%	61.7%	63.3%	66.2%	74.6%
Layoff rate	2.9%	2.8%	2.8%	2.6%	2.0%
Unemployment rate	4.9%	4.8%	4.6%	4.2%	3.1%
Employment	100.0	100.1	100.3	100.7	101.9
Output	100.0	100.2	100.6	100.9	99.5
Capital	100.0	100.4	101.0	101.7	101.2
Assets	100.0	99.8	99.2	98.2	93.8
Consumption	100.0	100.2	100.4	100.6	98.8
S.D. consumption	100.0	100.3	101.0	101.6	101.0
Non-search time	100.0	100.0	100.1	100.2	100.5
Welfare	100.0	100.3	100.8	101.9	104.2

Results (4)

Unemployment insurance with duration of benefits equal to one model period (exogenous job-finding rate)

Months of wages	$\lambda = 0.0$ laissez-faire	$\lambda = 0.67$ 1 month	$\lambda = 2.0$ 3 months	$\lambda = 4.0$ 6 months	$\lambda = 8.0$ 12 months
Job-finding rate	61.0%	61.0%	61.0%	61.0%	61.0%
Layoff rate	2.9%	2.9%	2.9%	2.9%	2.9%
Unemployment rate	4.9%	4.9%	4.9%	4.9%	4.9%
Employment	100.0	100.0	100.0	100.0	100.0
Output	100.0	100.0	100.0	100.0	100.2
Capital	100.0	100.0	100.0	100.0	100.3
Consumption	100.0	100.0	100.0	100.0	100.1
S.D. consumption	100.0	99.9	99.9	100.2	101.6
Welfare: no search disutility	100.0	100.0	100.0	99.9	99.7
Welfare	100.0	100.0	100.0	99.9	99.7

Results (5)

Unemployment insurance with duration of benefits equal to one model period (endogenous job-finding rate)

Months of wages	$\lambda = 0.0$ laissez-faire	$\lambda = 0.67$ 1 month	$\lambda = 2.0$ 3 months	$\lambda = 4.0$ 6 months	$\lambda = 8.0$ 12 months
Job-finding rate	61.0%	60.6%	59.8%	58.6%	56.0%
Layoff rate	2.9%	2.9%	2.9%	2.9%	2.9%
Unemployment rate	4.9%	4.9%	5.0%	5.1%	5.3%
Employment	100.0	100.0	99.9	99.8	99.6
Output	100.0	100.0	99.9	99.8	99.8
Capital	100.0	99.9	99.8	99.8	100.0
Consumption	100.0	100.0	99.9	99.8	99.7
S.D. consumption	100.0	99.9	99.8	100.0	100.9
Non-search time	100.0	100.0	100.0	100.0	100.0
Welfare	100.0	100.0	99.9	99.9	99.5