Topics for Today

1.) Quits + Layoffs

2.) Equilibrium Unemployment

3.) The Mortensen-Pissarides Model

Quits + Layoffs

- Last time we assumed the worker couldn't quit or recall past offers. In the simplest version of the McCall model we considered, these constraints are non-binding. A job that is acceptable today will remain so tomorrow. Likewise, a currently unacceptable job will remain so in the future.

- To see this more formally, suppose a worker can quit at any time, and compare the payoffs from 3 strategies:

A1 : Accept + work forever

$$\frac{w}{1-\beta}$$

A2 : Accept + quit after t periods

$$\frac{w-\beta^t w}{1-\beta} + \beta^t\left(c+\beta E v\right) = \frac{w}{1-\beta} - \beta^t \frac{w-\bar{w}}{1-\beta}$$

A3 : Reject

$$\frac{\bar{w}}{1-\beta}$$

Clearly,

if $w < \bar{w}$ then $A1 < A2 < A3$

if $w > \bar{w}$ then $A1 > A2 > A3$

if $w = \bar{w}$ then $A1 = A2 = A3$

(A similar argument applies to recalls).

- Of course, we do see quits + recalls. Why? Loosely speaking, something in the environment must be changing. Several realistic extensions of the basic McCall model will make either (or both) of the quit/recall options relevant:

1.) Either the wage dist., $F(w)$, itself changes over time, or knowledge/beliefs about it evolve.

2.) Finite Horizons

3.) Time-dependent Unemployment Compensation

4.) Risk Aversion (with incomplete financial mkts.)

5.) On-the-job search

- Incorporating these features typically produces a modified, state-dependent, reservation wage policy. You are asked to explore some of these in Problem Set 2.

Layoffs

- Now suppose

α : exogenous probability of being fired
(independent of tenure)

Bellman Eq.

$$\boxed{\hat{V}(w) = \max\left\{w + \beta\left[(1-\alpha)\hat{V}(w) + \alpha\left(c + \beta\int \hat{V}(w')dF\right)\right],\ c + \beta\int \hat{V}(w')dF\right\}}$$

- Now the reservation wage, $\bar{w}_f$, is characterized by:

$$\hat{V}(w) = \begin{cases} \dfrac{w + \beta\alpha\left[c + \beta E\hat{V}\right]}{1-\beta(1-\alpha)} & w \geq \bar{w}_f \\ c + \beta E\hat{V} & w \leq \bar{w}_f \end{cases}$$

- This can be solved for $\bar{w}_f$,

$$\frac{\bar{w}_f}{1-\beta} = c + \beta E\hat{V}$$

$\Longrightarrow$ Same as before, except now, since $E\hat{V} < EV$

$$\boxed{\bar{w}_f < \bar{w}}$$

- Intuitively, potential layoffs reduce the gains from search, and so reduce the reservation wage.
- What will be the effect on unemployment?

Equilibrium Unemployment

- The McCall model produces a simple "flow balance" model of equilibrium aggregate unemployment

- Again, let α = prob. of being fired

$$\Rightarrow \boxed{\frac{1}{\alpha} = \text{expected duration of employment}}$$

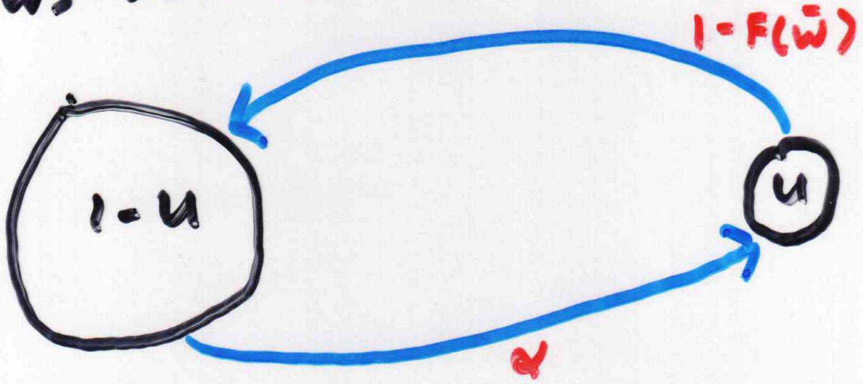
- Given the reservation wage policy, we know

$F(\bar{w})$ = prob. of rejecting a job offer

$\Rightarrow 1 - F(\bar{w})$ = prob. of accepting

$$\Rightarrow \boxed{\frac{1}{1-F(\bar{w})} = \text{expected duration of unemployment}}$$

- Our model can be visualized as consisting of flows between 2 "lakes"



- In equilibrium, the flows must balance

$$\alpha(1-u) = [1-F(\bar{w})]u$$

$$\Rightarrow \boxed{u = \frac{\alpha}{\alpha + 1 - F(\bar{w})}}$$

- Out of equilibrium, unemployment rate evolves as:

$$\boxed{u_{t+1} = \alpha(1-u_t) + F(\bar{w})u_t}$$

- Imposing $u_{t+1} = u_t = u$ we again get

$$u = \frac{\alpha}{\alpha + 1 - F(\bar{w})}$$

- Dividing numerator + denominator by $\alpha(1-F(\bar{w}))$,

$$\boxed{\begin{aligned} u &= \frac{[1-F(\bar{w})]^{-1}}{\alpha^{-1} + [1-F(\bar{w})]^{-1}} \\ &= \frac{\text{avg. duration of unemp.}}{\text{avg. duration of unemp.} + \text{avg. duration of employ.}} \end{aligned}}$$

- Note, in this model there is a correspondence between the steady state cross-sectional dist. (e.g., the aggregate unemployment rate at a pt. in time), and the time-series dist. confronting each individual (e.g., the average proportion of time a given person is unemployed). That's what makes the model so tractable.

A Problem with McCall

Where does $F(w)$ come from? Since $F(w)$ is assumed exogenous, the simple McCall model is best viewed as a partial equilibrium model. There are ways to extend McCall to a GE model (e.g., the 'islands model' of Lucas and Prescott (1974)). However, we now consider a more radical departure from McCall, which focuses more on aggregate issues, and less on the decision problems of individuals.

The Mortensen - Pissarides Model

Assumptions

1.) Continuum of identical workers of measure 1.

2.) Workers are infinitely lived + risk neutral.

3.) Leisure valued at z while unemployed.

4.) CRS production, with labor as only input.

5.) Each employed worker produces y units of output.

6.) Firms incur a vacancy cost, c, when looking for workers.

7.) Matches exogenously destroyed with prob. s per period.

8.) Free entry + exit ($\Rightarrow$ zero profits for vacant firms).

9.) Matches mediated through a CRS "matching function", $M(u,v) = A u^{\alpha} v^{1-\alpha}$ ("Random Search").

10.) Wages determined ex post via Nash Bargaining

- We shall see that the final 2 assumptions are the most important.

- By definition,

$\frac{M}{V}$ = prob. of filling a vacancy

$\frac{M}{u}$ = prob. of finding a job

- By CRS assumption,

$$\frac{M}{V} = M(u/v, 1) = q(v/u) = q(\theta)$$

where θ = labor mkt. "tightness" (from firm's perspective).

<u>Example</u>

If $M = u^{\alpha} v^{1-\alpha}$ then $q = (v/u)^{-\alpha} = \theta^{-\alpha}$

Since $M = vq(\theta)$ we have $\frac{M}{u} = \frac{v}{u} q(\theta) = \theta q(\theta)$

<u>Flow Equilibrium</u>

$$\underbrace{s(1-u)}_{\text{job loser}} = \underbrace{\theta q(\theta) u}_{\text{job finders}}$$

$$\Longrightarrow \boxed{u = \frac{s}{s + \theta q(\theta)}}$$

> 1 of 3 key eqs. of the MP model.

- We need to determine θ

Bellman Eqs.

1.) $J = y - w + \beta[sV + (1-s)J]$ > value of filled job

2.) $V = -c + \beta[q(\theta)J + (1-q(\theta))V]$ > value of vacancy

3.) $E = w + \beta[sU + (1-s)E]$ > value of being employed

4.) $U = z + \beta[\theta q(\theta)E + (1-\theta q(\theta))U]$ > value of being unemployed.

- Impose equil. condition $(V=0)$, and solve for J from (2).

$$J = \frac{c}{\beta q(\theta)}$$

> value of an operating firm must cover the PDV of search costs.

- Substitute this into (1), again using $V=0$, and let $1/\beta = 1+r$

$$\boxed{w = y - \frac{r+s}{q(\theta)}c}$$

> 2nd of 3 key eqs. of MP model

wage that ensures zero profits

- Finally, wages must be consistent with Nash Bargaining

$$\max_{(E-U),\,J} (E-U)^{\phi} J^{1-\phi} \quad \text{s.t. } \underbrace{S = E-U+J}_{\text{Match Surplus}}$$

Solution: $E-U = \phi S \qquad J = (1-\phi)S$

- Note, ϕ indexes the "bargaining power" of workers.

- Use (1) and (3) to solve for J + E, and then sub into Nash Bargain.

$$(5) \qquad W = \underbrace{\frac{r}{1+r}U}_{\substack{\text{annuity value of being unemployed} \\ \text{"reservation wage"}}} + \phi\underbrace{\left(y - \frac{r}{1+r}U\right)}_{\text{one-period match surplus}}$$

- Use (4) to solve for $E-U$ + sub into Nash Bargain (using expression for J). This gives.

$$\frac{r}{1+r}U = z + \frac{\phi\theta c}{1-\phi}$$

- Sub this into (5).

$$\boxed{W = z + \phi(y - z + \theta c)} \quad \text{3rd eq. of MP model}$$

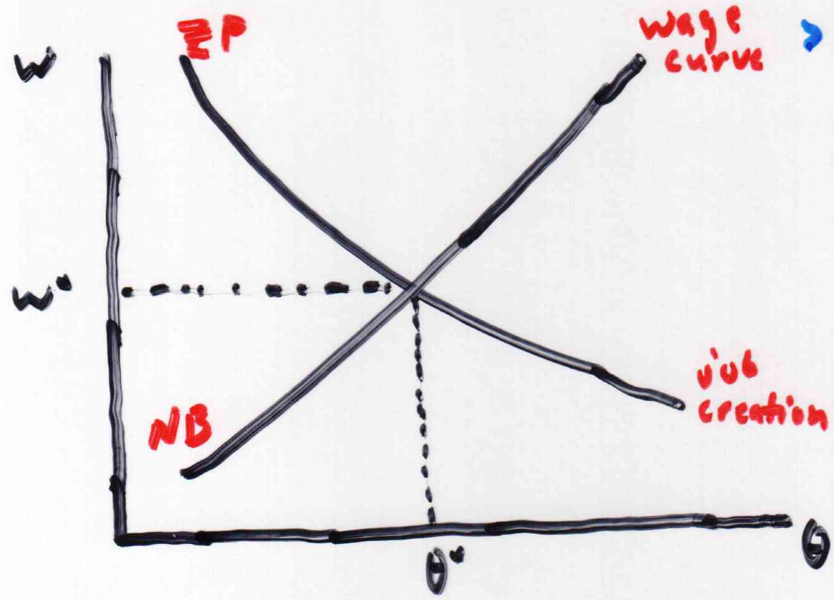
This says workers get share ϕ of the saved hiring cost, scaled by mkt. tightness, θ.

Graphical Summary of M-P Model

① $u = \frac{s}{s + \theta q(\theta)}$ > Beveridge Curve

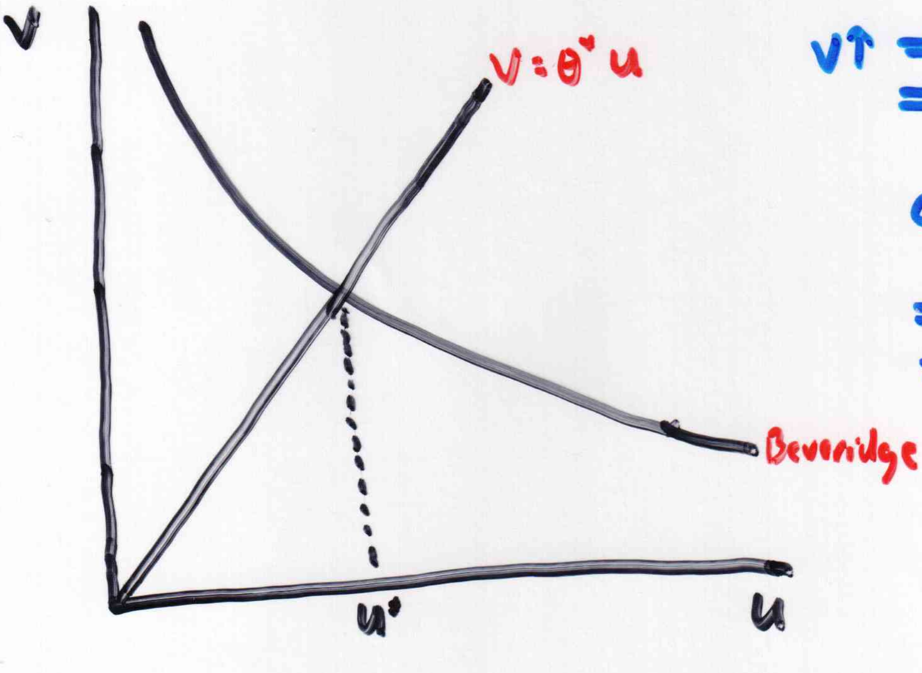
② $w = y - \frac{r+s}{q(\theta)} c$ > Zero Profit wage (job creation curve)

③ $w = z + \phi(y - z + \theta c)$ > Nash Wage (wage curve)



> $\theta \uparrow \Rightarrow$ workers bargaining power $\uparrow$
$\Rightarrow w \uparrow$

> $w \uparrow \Rightarrow$ less attractive to create vacancies
$\Rightarrow \theta \downarrow$



$v \uparrow \Rightarrow$ easier to find jobs
$\Rightarrow u \downarrow$

concavity of matching function
$\Rightarrow$ diminishing returns
$\Rightarrow$ convexity of Bev. Curve.