Mortensen-Pissarides labor market environment

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Motivation and agenda

- In perfectly competitive labor markets there is no involuntary unemployment and households can freely choose how much to work at the market wage
- To provide a theory that better explains the unemployment patterns observed in reality, Mortensen-Pissarides model introduces search frictions to the labor market
- Plan for this presentation is to
  - Introduce basic Mortensen-Pissarides labor market model
  - Discuss key takeaways and possible variations of the model

Conceptual set-up

- Continuum of firms and workers
- Each firm has one job which is either vacant and searching or filled and producing
- Each worker is either unemployed and searching or employed and producing
- Finding a productive match is time-consuming and costly
- Workers and vacancies are randomly matched to create a job
- Wages are determined through Nash bargaining
- Jobs are destroyed at an exogenous rate λ

Matching function

- Total labor force L=1, v=number of vacancies, u=unemployment
- Matching function $M(u, v)$ gives the number of jobs formed at a given point in time:
  - Increasing in both arguments
  - Constant returns to scale
- Defining a varible $Q^e = \frac{v}{u}$, which reflects market tightness, we can express

  Pr(unemployed finds a job): $\phi^w(Q^e) = \frac{M(u,v)}{u} = M(\frac{u}{v}, 1)Q^e$

  Pr(vacancy is filled): $\phi^f(Q^e) = \frac{M(u,v)}{v} = M(\frac{u}{v}, 1)$

Key elements of the Mortensen-Pissarides labor market environment

- Mortensen-Pissarides labor market environment has 3 key elements:
  1. **Flows between labor market states**
  2. **Job creation**
  3. **Wage determination**
- Each of these three elements can be solved for one equation which together characterize the steady state equilbrium u, Q^e and w of the Mortensen-Pissarides labor market environment

1. Key elements - Flows between labor market state

- During a small time interval δt number of people transitioning
  - into unemployment is $\lambda(1-u)\delta t$
  - out of unemployment is $u\phi^w(Q^e)\delta t$
- Change in unemployment is given by $(\dot{u}) = \lambda(1-u) - u\phi^w(Q^e)$
- In steady state, employment rate is constant, allowing us to express the steady state unemployment as

  $u = \frac{\lambda}{\lambda+\phi^w(Q^e)}$
- Equation characterizing the steady state unemployment rate is also known as the Beveridge curve

2.Key elements - Job creation

- J = present discounted value of expected profit from a filled job
- V = present discounted value of expected profit from a vacancy
- Considering vacancies and jobs as assets of the firm, under complete markets, the capital cost of an asset must equal its rate of return:

$$rV = -c + \phi^f(Q^e)(J - V) \tag{1}$$

$$rJ = p - w + \lambda(V - J) \tag{2}$$

where c = hiring cost, w = wage, p = value of output

- All firms free to post vacancies, so new vacancies posted until V=0
- Combining (1) and (2) with $V = 0$ yields the job creation equation

$$p - w - \frac{(r + \lambda)c}{\phi^f(Q^e)} = 0 \tag{3}$$

3. Key elements - Wage determination

- A job yields a surplus of $J_i + W_i - U - V$ due to search frictions
- Wage rate w_i is the solution to the Nash bargaining problem over this surplus

$$w_i = argmax(W_i - U)^{\beta}(J_i - V)^{1-\beta} \tag{4}$$

$\beta =$ bargaining power of worker
$U =$ present discounted value of expected income when unemployed
$W_i =$ present discounted value of expected income when employed

- Using the value functions for U and V, the steady state wage equation can be expressed as

$$w = (1 - \beta)z + \beta(p + cQ^e) \tag{5}$$

$z =$ UI benefit + other possible income during unemployment

Key takeaways and variations of the model

- Key distinctions with respect to perfectly competitive labor markets
  - Jobs enjoy rents in equilibrium due to search frictions
  - Labor effort is fixed
  - Unemployment persists in equilibrium
- In the context of business cycle models, Mortensen-Pissarides labor market provides a a possible method to improve the fit of the models in terms of the fluctuations in hours worked
- Variations of the model include for example
  - Different wage determination processes
  - Endogenous job destruction
  - On the job search

Backup

Workers

- Value functions for the worker are

$$rU = z + \phi^w(Q^e)(W - U) \tag{6}$$

$$rW = w + \lambda(U - W) \tag{7}$$

- rU can be interpreted as the worker's reservation wage

Steady state equilbrium - graphical presentation