

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 variable $Q^e = \frac{v}{u}$, which reflects market tightness, we can express

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

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

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 equilibrium 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:

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

$$rJ = p - w + \lambda(V - J) \quad (2)$$

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

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

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

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

β = 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

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

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 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

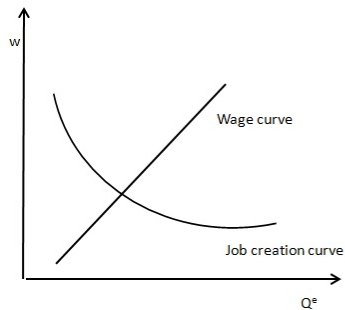
$$rU = z + \phi^w(Q^e)(W - U) \quad (6)$$

$$rW = w + \lambda(U - W) \quad (7)$$

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

Steady state equilibrium - graphical presentation

Equilibrium wages and market tightness



Equilibrium wages and unemployment

