Session 5: Labor market - unemployment modelling

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Recap last lecture

- Unemployment an important macro phenomenon
- Facts: U is volatile and flows are large
- Worked through prototypical business cycle S&M model (DMP)
- Basic ideas of search-paradigm:
  - Labor not traded on spot-market
  - Bilateral contracts (non-Walrasian)

Today's session

1. Efficient level of unemployment and search
2. Compute and study dynamics
3. Extend model to more business cycle variables
4. Shimer puzzle: The inability of DMP model to generate volatility in V/U ratio

Can unemployment be efficient?

- Idle resources - appears wasteful
- Many theories claim unemployment is inefficient
- But in S&M models unemployment is necessary and productive:
  - $M_t = V_t^{1-\lambda} U_t^{\lambda}$
- Example: Lower U would require higher V
  - But high V costs cV every period
  - High U is also costly (not producing output)
- Optimal level of V and U in search models?
  - Two externalities pushing in opposite directions
    - Congestion
    - Appropriability

Congestion externalities

$M_t = V_t^{1-\lambda} U_t^{\lambda}$, $\lambda < 1$

- Because of concavity, more vacancies yields:
  - Lower vacancy filling probability, $q_t = \frac{M_t}{V_t}$
    - negative externality (i.e. competitive equilibrium yields too many vacancies)
  - Higher job finding probability: f_t
    - positive externality

Appropriation externalities

- *Ex post* (when the vacancy cost is sunk) the match has a surplus
- This surplus is appropriated (divided) in the bargaining process
- In the simple model only firms have search costs
  - Firm pays full cost, but only gets part of benefit
    $\Rightarrow$ Incentives to post vacancies too low (hold-up problem)
- Symmetric if workers also search
  - Makes appropriation externalities larger: Both workers and firms search too little

(Constrained) Efficiency

- Hosios (1990): What is the efficient level of unemployment and search? "**Hosios conditions**"
- (Congestion effect = Appropriation externality)
- Recall: Job creation condition:

$$\begin{aligned} c &= q(\theta_t)\,\beta E_t J_{t+1} \\ &= q(\theta_t)\,\beta E_t\,(1-\varphi)\,\underbrace{(J_{t+1}+H_{t+1})}_{\text{total surplus}} \end{aligned}$$

Efficient level obtains if the fraction of surplus accruing to each type of agent coincides with the elasticity of the matching function w.r.t. his search input

- "Employer bargaining strength = importance of vacancies in matching function"
  - $1-\varphi = 1-\lambda$
- Suboptimal: if employer share of surplus "too low", $1-\varphi < 1-\lambda$, $\Rightarrow$ too few vacancies posted and unemployment too high

Dynamics and Dynare

- Dynare is a useful tool computing model dynamics (also has lot of other functionality)
- Most people use Dynare wiht Matlab

Example code: The DMP model

```
model;
j=exp(z)-w+beta*(1-sigma)*j(+1);
h=w-b+beta*((1-sigma)-f)*h(+1);
const=q*beta*j(+1);
phi*j=(1-phi)*h;
m=mp*v^(1-lam)*u^lam;

f=m/u;
q=m/v;
n=(1-sigma)*n(-1)+m(-1);
u=1-n;

z = rho*z(-1) + e;
end;
```

MATLAB R2013a

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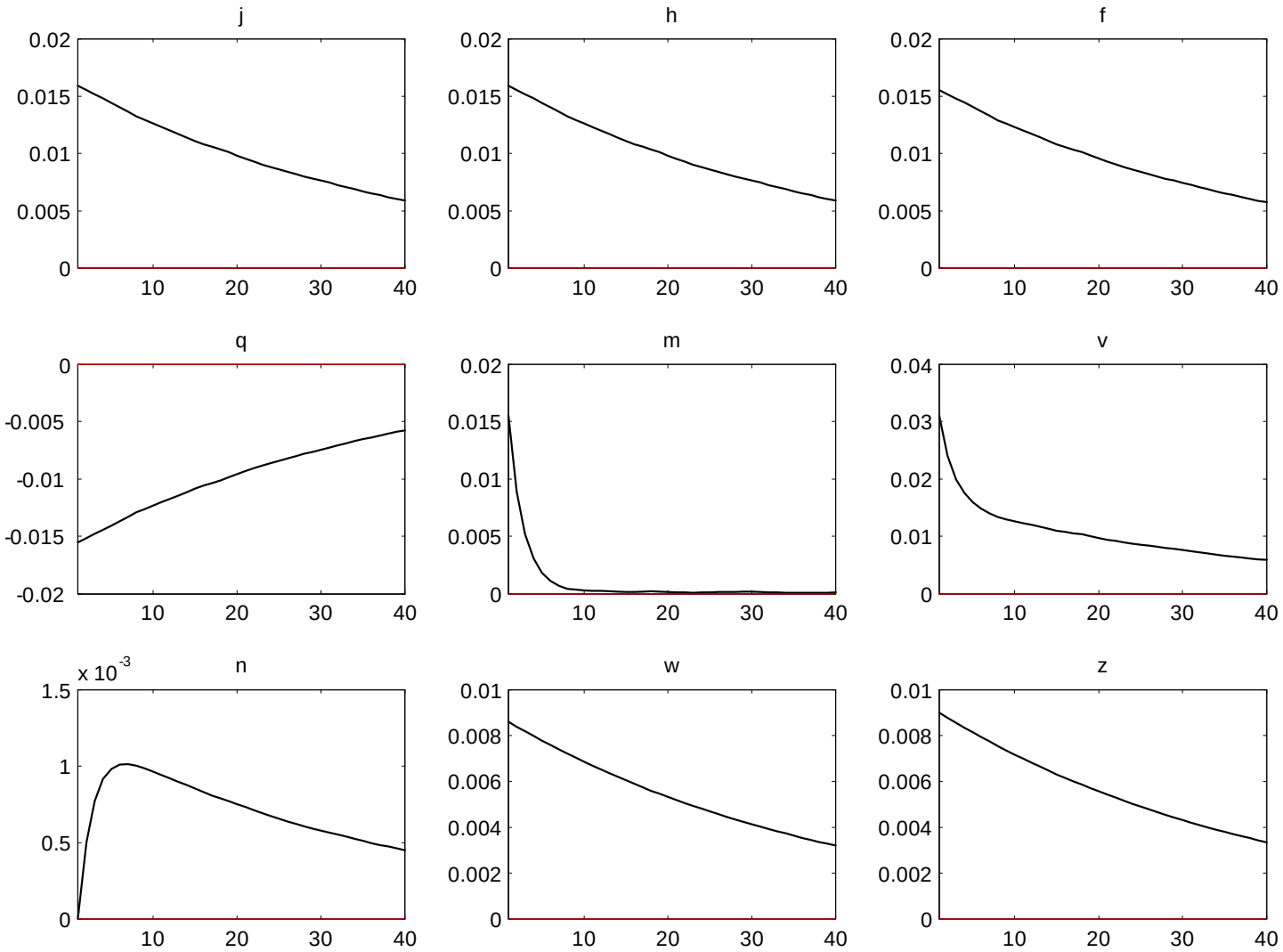
C: ▸ kalles ▸ Undervisning - 1a års-makro del två ▸ dynare models ▸

Command Window

```
STEADY-STATE RESULTS:

j         0.621742
h         0.621742
f         0.39936
q         0.757457
m         0.0296261
v         0.0391125
u         0.0741837
w         0.978901
z         0
n         0.925816

MODEL SUMMARY

  Number of variables:         10
  Number of stochastic shocks: 1
  Number of state variables:   3
  Number of jumpers:           2
  Number of static variables:  5


MATRIX OF COVARIANCE OF EXOGENOUS SHOCKS

Variables       e
e            0.000081

POLICY AND TRANSITION FUNCTIONS
                                     j              h              f              q              m              v              n
Constant                      0.621742       0.621742       0.399360       0.757457       0.029626       0.039112       0.925816       0.9
m(-1)                                0              0              0              0      -0.399361      -0.527238       1.000000
z(-1)                         1.091373       1.091373       0.683491      -1.296361       0.050704       0.133879              0       0.9
```

Impulse response functions to productivity shock



exp() so that Taylor-expansion is log-linear: percentage devs

```
model;
exp(j)=exp(z)-exp(w)+beta*(1-sigma)*exp(j(+1));
exp(h)=exp(w)-b+beta*((1-sigma)-exp(f))*exp(h(+1));
const=exp(q)*beta*exp(j(+1));
phi*exp(j)=(1-phi)*exp(h);

exp(m)=mp*exp(v)^(1-lam)*exp(u)^lam;
exp(f)=exp(m)/exp(u);
exp(q)=exp(m)/exp(v);
exp(n)=(1-sigma)*exp(n(-1))+exp(m(-1));
exp(u)=1-exp(n);

z = rho*z(-1) + e;
end;
```

Combining DMP with RBC - Merz (1995)

Model - prelims

Risk-aversion, but households perfectly insured against unemployment risk

$$U(C, N) = \log(C_t) - \frac{N^{1-1/v}}{1-1/v}$$

v is the negative of the **Frisch elasticity**
(=wage elasticity of labor supply at a constant marginal utility of wealth)

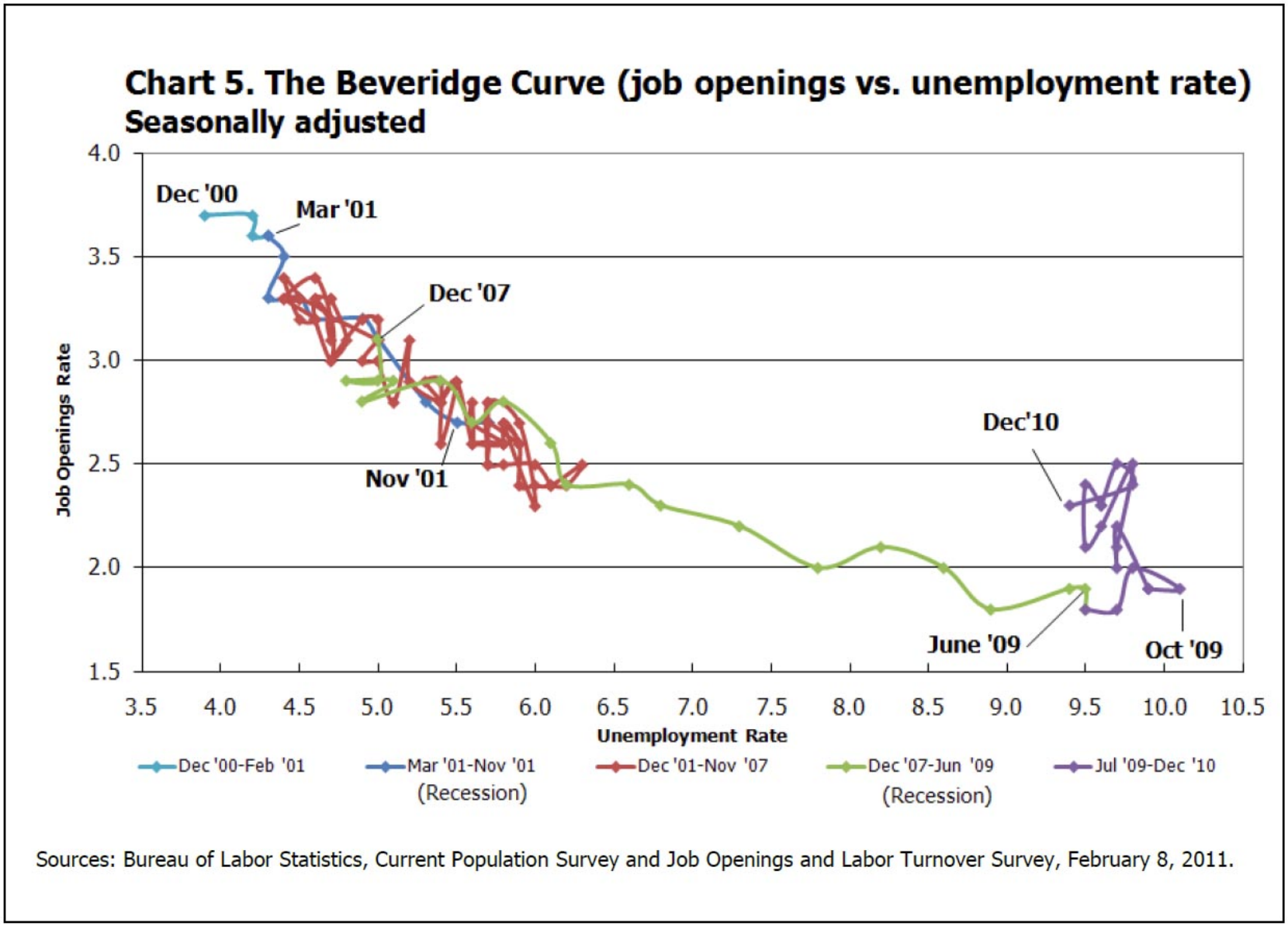
$$\begin{aligned} Y_t &= \exp(z_t) K_t^{\alpha} N_t^{(1-\alpha)} \\ Y_t &= C_t + I_t + cV_t \\ K_{t+1} &= (1-\delta) K_t + I_t \end{aligned}$$

(Merz also includes workers' search margin)

Quantitative results from Merz

[See separate file]
E: Employment, LS: Labor's share of total income,
P: avg labor producitivity, w: real wage rate

Beveridge curve



Comments on Mertz (1995) results

- $\sigma(Y), \sigma(E)/\sigma(Y)$ $\rho(V, u)$ hint at Shimer puzzle
- $\rho(V, u) = -0.15 \ll -0.95$: Beveridge curve too flat
- Still Merz's quantitative results considered as huge progress

Shimer (2005) puzzle

- Sets up and calibrates DMP model with exogenous constant separation rate
  - Aggregate stochastic version of Pissarides (1985 or 2000)
- Results for model with only productivity shocks:
  - $\theta_t \equiv V_t / U_t$ is ten times more volatile in data than in DMP model
  - Job finding rate f_t is 12 times more volatile in data than in DMP model
- Wages and in particular Nash bargaining with unemployment as "threat point"/outside option central for this model deficiency
- Recall

$$w_t = \varphi z_t + (1 - \varphi)\left(b + \beta f\left(\theta\right) E_t H_{t+1}\right),$$

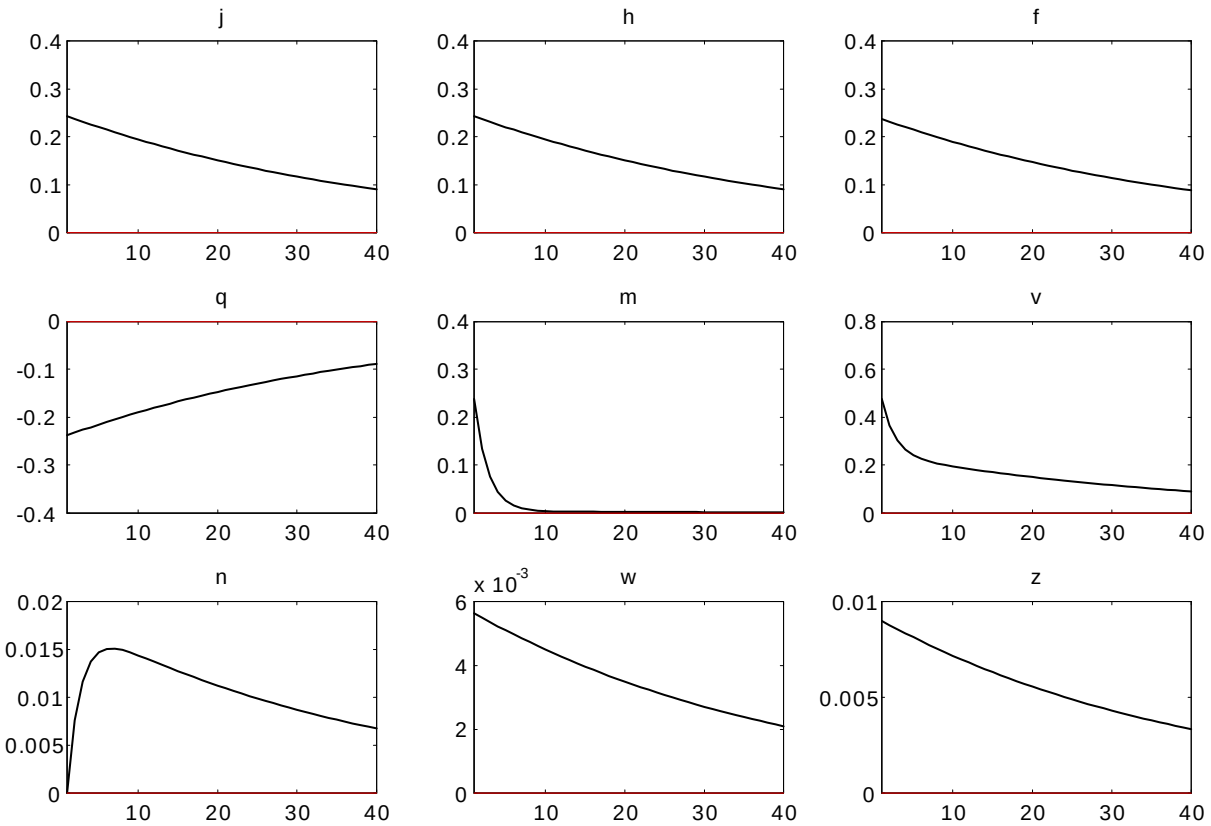
$z \uparrow \Rightarrow v \uparrow \Rightarrow f \uparrow \Rightarrow$worker outside option$\uparrow \Rightarrow w \uparrow$ more than φz

Data aspects of Shimer puzzle

- JOLTS - Job Openings and Labor Turnover Survey
  - Detailed high-frequency data on vacancies from 2000
  - Worse data before then
- Controversy regarding how important variation in separation rates are for unemployment
- Shimer's claim that separations unimportant contradicted in later work:
  - Fujita and Ramey (2009)
  - Barnichon (2012)

IRF with Hagedorn-Manowski calibration

$b = 0.98$ and $\varphi = 0.1$



Summary of lecture

- DMP model
  - Efficiency
  - Dynamics: Moments and IRFs
  - Key limitation
- Ready for problem set on DMP, including Dynare exercise

Extra references

Barnichon, Regis, 2012, “Vacancy posting, Job Separation and Unemployment Fluctuations,’” Journal of Economic Dynamics and Control.
Hosios, Arthur J, 1990. "On the Efficiency of Matching and Related Models of Search and Unemployment," Review of Economic Studies, vol. 57(2), pages 279-98, April.
Fujita, Shigeru & Garey Ramey, 2009. "The Cyclicality Of Separation And Job Finding Rates," International Economic Review, vol. 50(2), pages 415-430.