The unemployment volatility puzzle

- Mortensen & Pissarides search and matching model standard theory of equilibrium unemployment
    - (other theory: Layard – Nickell – Jackman wage & price curves)

- Combined with RBC- models to derive model of business fluctuations with labour market fluctuations

Shimer AER 2005:

- model cannot explain the cyclical behaviour of two of its central variables: unemployment and vacancies

- Compares predictions of standard search model with empirical data for the U.S.

- Look at two shocks: changes in labour productivity and in separation rate of employed worker

Higher labour productivity:

- ⇨ more profitable to open vacancies, and unemployment falls
- ⇨ workers’ threat points increase, and wages rise
- ⇨ mitigates increase in profitability of opening vacancies
- ⇨ overall, little impact on vacancies and unemployment

Higher separation rate:

- ⇨ leads to higher unemployment, but does not affect relative value of unemployment and vacancies
- ⇨ leads to counterfactually positive correlation between unemployment and vacancies

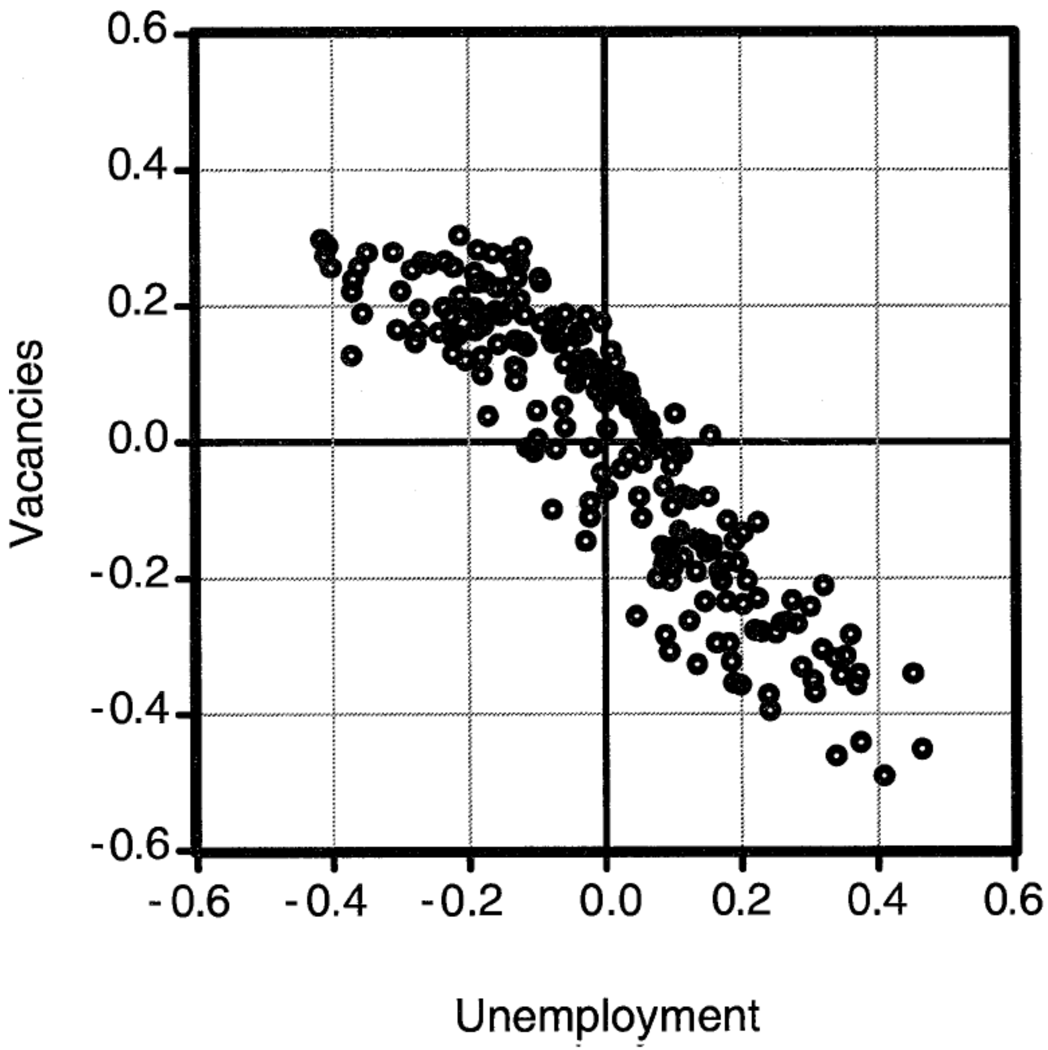

FIGURE 4. QUARTERLY U.S. BEVERIDGE CURVE, 1951–2003

TABLE 1—SUMMARY STATISTICS, QUARTERLY U.S. DATA, 1951–2003

		u	v	v/u	f	s	p
Standard deviation		0.190	0.202	0.382	0.118	0.075	0.020
Quarterly autocorrelation		0.936	0.940	0.941	0.908	0.733	0.878
Correlation matrix	u	1	−0.894	−0.971	−0.949	0.709	−0.408
	v	—	1	0.975	0.897	−0.684	0.364
	v/u	—	—	1	0.948	−0.715	0.396
	f	—	—	—	1	−0.574	0.396
	s	—	—	—	—	1	−0.524
	p	—	—	—	—	—	1

Notes: Seasonally adjusted unemployment u is constructed by the BLS from the Current Population Survey (CPS). The seasonally adjusted help-wanted advertising index v is constructed by the Conference Board. The job-finding rate f and separation rate s are constructed from seasonally adjusted employment, unemployment, and mean unemployment duration, all computed by the BLS from the CPS, as explained in equations (1) and (2). u, v, f, and s are quarterly averages of monthly series. Average labor productivity p is seasonally adjusted real average output per person in the non-farm business sector, constructed by the Bureau of Labor Statistics (BLS) from the National Income and Product Accounts and the Current Employment Statistics. All variables are reported in logs as deviations from an HP trend with smoothing parameter 10^5.

$$(3) \quad \dot{u}(t) = s(t)(1 - u(t)) - f(\theta_{p(t),s(t)})u(t)$$

where $(p(t), s(t))$ is the aggregate state at time t. A flow $s(t)$ of the $1 - u(t)$ employed workers become unemployed, while a flow $f(\theta)$ of the $u(t)$ unemployed workers find a job. An initial condition pins down the unemployment rate and the aggregate state at some date t_0.

I characterize the v-u ratio using a recursive equation for the joint value to a worker and firm of being matched in excess of breaking up as a function of the current aggregate state, $V_{p,s}$.

$$(4) \quad rV_{p,s} = p - (z + f(\theta_{p,s})\beta V_{p,s}) - sV_{p,s}$$
$$+ \lambda(\mathbb{E}_{p,s} V_{p',s'} - V_{p,s}).$$

Another critical equation for the match value comes from firms' free entry condition. The flow cost of a vacancy c must equal the flow probability that the vacancy contacts a worker times the resulting capital gain, which by Nash bargaining is equal to a fraction $1 - \beta$ of the match value $V_{p,s}$:

$$c = q(\theta_{p,s})(1 - \beta)V_{p,s}. \tag{5}$$

Eliminating current and future values of $V_{p,s}$ from (4) using (5) gives

$$\frac{r + s + \lambda}{q(\theta_{p,s})} + \beta\theta_{p,s} = (1 - \beta)\frac{p - z}{c} + \lambda\mathbb{E}_{p,s}\frac{1}{q(\theta_{p',s'})} \tag{6}$$

which implicitly defines the v-u ratio as a function of the current state (p,s).[13] This equation

First, suppose there are no aggregate shocks, $\lambda = 0$.[14] Then the state-contingent v-u ratio satisfies

$$\frac{r + s}{q(\theta_{p,s})} + \beta \theta_{p,s} = (1 - \beta) \frac{p - z}{c}.$$

The elasticity of the v-u ratio θ with respect to "net labor productivity" $p - z$ is

$$\frac{r + s + \beta f(\theta_{p,s})}{(r + s)(1 - \eta(\theta_{p,s})) + \beta f(\theta_{p,s})}$$

where $\eta(\theta) \in [0,1]$ is the elasticity of $f(\theta)$. This is large only if workers' bargaining power β is small and the elasticity η is close to one. But with reasonable parameter values, it is close to 1. For example, think of a time period as equal to one month, so the average job-finding rate is approximately 0.45 (Section I C), the elasticity $\eta(\theta)$ is approximately 0.28 (Section I C again), the average separation probability is approxi-

Hagedorn and Manovski

- Assume that z close to unity, implying that p-z is very sensitive to fluctuations in p.
- Makes v-u ratio very sensitive to changes in p, consistent with empirical evidence

Implausible, because

- Makes unemployment volatility very sensitive to variation in z, which among other things depend on unemployment benefits (cross country differences)
- Implausible to assume that the effective replacement rate is 85-90 percent

TABLE 3—LABOR PRODUCTIVITY SHOCKS

		u	v	v/u	f	p
Standard deviation		0.009	0.027	0.035	0.010	0.020
		(0.001)	(0.004)	(0.005)	(0.001)	(0.003)
Quarterly autocorrelation		0.939	0.835	0.878	0.878	0.878
		(0.018)	(0.045)	(0.035)	(0.035)	(0.035)
	u	1	−0.927	−0.958	−0.958	−0.958
			(0.020)	(0.012)	(0.012)	(0.012)
	v	—	1	0.996	0.996	0.995
				(0.001)	(0.001)	(0.001)
Correlation matrix	v/u	—	—	1	1.000	0.999
					(0.000)	(0.001)
	f	—	—	—	1	0.999
						(0.001)
	p	—	—	—	—	1

Notes: Results from simulating the model with stochastic labor productivity. All variables are reported in logs as deviations from an HP trend with smoothing parameter 10^5. Bootstrapped standard errors—the standard deviation across 10,000 model simulations—are reported in parentheses. The text provides details on the stochastic process for productivity.

Nash Bargaining:

- Wages respond strongly to changes in productivity

that a continually renegotiated wage solves

$$(7) \qquad w_{p,s} = (1 - \beta)z + \beta(p + c\theta_{p,s}).$$

- If workers' bargaining power is stochastic, this generates realistic movements in the v-u ratio

- Suggests that a version of the model with a combination of wage and labour productivity shocks could generate the observed behaviour of unemployment, vacancies and real wages

Hall AER 2005

- Assume that real wages are determined by a social norm that does not change over the business cycle

- Consistent with efficiency as long as the existing real wage is within the bargaining set, i.e. that both parties gain from continuing the relationship

Hall & Milgrom AER 2008:

- threat points depend on the "inside option" – relative costs of delay - which is less sensitive to cyclical fluctuations
- wages become more rigid

Pissarides, forthcoming Econometrica:

Is wage stickiness the answer?

Argues that

- Vacancies depend on the wage for new matches

- Empirical evidence shows that wages are more flexible for new matches

- Wage rigidity is not the reason for unemployment volatility

- Suggest different explanation – the existence of fixed costs to vacancy creation

- If vacancy costs rise less than in proportion to the duration of vacancies, the firm's incentive to post vacancies remain high in a boom, leading to more volatility in vacancies and unemployment

Distinguishing between new and continuing jobs:

The asset values of belonging to a new or continuing job are now respectively distinguished by superscript n or c. In continuing jobs the asset values are as in (4) and (7), except that J, W and w are distinguished by superscript c. In new jobs we now have

$$\begin{aligned} (r+s)J^n &= p - w^n + \lambda(J^c - J^n) && (11) \\ (r+s)(W^n - U) &= w^n + \lambda(W^c - W^n) - rU. && (12) \end{aligned}$$

I define the surplus from new jobs as $S^n = J^n + W^n - U$. Making use of all asset-value equations for new and continuing jobs to calculate S^n, I obtain

$$S^n = \frac{p - rU}{r+s}. \qquad (13)$$

The duration of new jobs does not influence their net surplus.

Nash bargaining for new jobs gives a job creation condition that is identical to the one in the canonical model:

I assume that the Nash sharing rule holds for new jobs but not necessarily for continuing jobs. The rule in (6) implies $J^n = (1-\beta)S^n$, and so job creation is given by

$$(1-\beta)S^n = (1-\beta)\frac{p - rU}{r+s} = \frac{c}{q(\theta)}. \tag{14}$$

From (9), which still holds for new jobs, I get the job creation condition for this model:

$$\frac{(1-\beta)(p-z) - \beta c\theta}{r+s} = \frac{c}{q(\theta)}. \tag{15}$$

If the economy shifts between to states i and j:

$$w_i^n = w_i^N + \frac{\lambda}{r+s+\lambda}(w_j^n - w_j^c), \tag{19}$$

Empirical evidence:

Should not look at times series evidence of aggregate wages, because it

- includes continuing wages
- is affected by composition bias (low productive workers more likely to lose their jobs in a downturn, dampening the fall in aggregate wages)

Panel data studies show that wages of new hires are procyclical

Fixed costs of hiring H

introduce a cost of taking up the worker in the vacancy equation. The vacancy equation now becomes:[29]

$$rV = -c + q(\theta)(J - H - V).$$

The important property of this reformulation is that the constant posting cost c is now effectively replaced by the cost $c + q(\theta)H$, which falls in tightness. The job creation and wage equations with this vacancy equation become,

$$\frac{p-w}{r+s} = \frac{c}{q(\theta)} + H \tag{28}$$

$$w = (1-\beta)z + \beta(p + c\theta + f(\theta)H). \tag{29}$$

Makes the v-u ratio much more sensitive to changes in productivity, consistent with empirical evidence

Table 4: Model results at different job creation costs

H	c	ε_θ	ε_w	ε_w^*
0	0.36	3.67	0.98	0.88
0.1	0.27	4.18	0.99	0.97
0.2	0.20	4.87	0.99	0.98
0.3	0.11	5.82	1.00	1.00
0.4	0.02	7.25	1.01	1.01