Unemployment volatility puzzle and the role of wage determination

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Outline

1. Important elasticities
2. Shimer (2005)
3. Hall (2005)
4. Hagedorn and Manovskii (2008)
5. Hall and Milgrom (2008)
6. Ljungqvist and Sargent (2015)
7. Comments on wage rigidity

Elasticities

Equilibrium conditions

- recall our job creation curve

$$\frac{\rho + \delta + \gamma p(\theta)}{q(\theta)} = (1-\gamma)\frac{y-z}{c}$$

- we can compute elasticity wrt $y - z$

$$\frac{\partial \log \theta}{\partial \log \frac{y-z}{c}} = \frac{\delta + \rho + \gamma p(\theta)}{\delta + \rho(1-\eta(\theta)) + \gamma p(\theta)}$$

where $\eta(\theta)$ is the elasticity of $p(\theta)$,

$$\eta(\theta) \equiv \frac{p'(\theta)\theta}{p(\theta)}$$

Response to a positive productivity shock

- value of posting a vacancy goes up $\rightarrow$ v increases
- higher $v - u$ ratio raises job-finding rate $\rightarrow$ u decreases
- move to the southeast on the Beveridge curve
- more hires $\rightarrow$ shorter unemployment spells, higher value of unemployment
- unemployed have a higher threat point in bargaining
- higher wages $\rightarrow$ lower incentives for firms to post vacancies
- $\rightarrow$ small equilibrium response

Response to a negative shock separation probability

- higher separation probability $\rightarrow$ shorter duration of a match
- higher inflow into unemployment $\rightarrow$ u increases
- shorter employment duration $\rightarrow$ lower incentives to post vacancies, v decreases

Comparative statics: elasticities

- value for the U.S. (monthly): $p = 0.45, \delta = 0.034, \rho = 0.004$
- with Cobb-Douglas matching function, $m = \bar{m} u^{\alpha} v^{1-\alpha}$, we have $\eta(\theta) = 1 - \alpha$
- under Hosios condition, $\gamma = 1 - \eta$, and for $\eta \in [0.5, 0.7]$

$$\frac{\partial \log \theta}{\partial \log \frac{y-z}{c}} \in [1.03, 1.08], \qquad \frac{\partial \log f(\theta)}{\partial \log \frac{y-z}{c}} \in [0.31, 0.54]$$

- elasticities with respect to δ

$$\frac{\partial \log \theta}{\partial \log \delta} \in [-0.14, -0.10]$$

- not a success: in the data, volatility of θ is 20-times higher than of average productivity

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- not a success: in the data, volatility of θ is 20-times higher than of average productivity
- in principle, we can generate a recession by moving c
  - suppose $z = 0$, then to decrease θ by 50 percent (which is the case in a recession), you need to cut y/c by 50 percent
  - keeping y constant, this means doubling c ... this is probably too much

Comparative statics: elasticities

- in the decentralized market

$$\frac{\rho + \delta}{q(\theta)} + \gamma\theta = (1 - \gamma)\frac{y - z}{c}$$

- elasticity:

$$\frac{\partial \log \theta}{\partial \log \frac{y-z}{c}} = \frac{\rho + \delta + \gamma p(\theta)}{(\rho + \delta)(1 - \eta) + \gamma p(\theta)}$$

  where η is the elasticity of $p(\theta)$

- elasticity increases when bargaining power of a worker decreases: $\gamma = 0.1$ elasticity 1.15, $\gamma = 0$ elasticity 1.39

- unless z is close to p, θ is unresponsive to shocks to p
- θ barely moves in response to δ

Summary

- standard MP model
  - labor productivity shocks
  - separation rate shocks
  - shocks to bargaining power
- only non-trivial decision: how many vacancies to post
- unemployment volatility puzzle (Shimer puzzle):
  - given productivity shocks of plausible magnitude, the MP model cannot explain observed cyclical behavior of unemployment, vacancies, and the job-finding rate
- why
  - under Nash bargaining, wages absorb shocks to labor productivity

Notation and setup

- standard DMP model
- under Nash bargaining, wages absorb shocks to labor productivity

r	discount rate
s, f	separation rate, job-finding rate
p	productivity
z	value of leisure
c	vacancy posting costs
$m = \mu u^{\alpha} v^{1-\alpha}$	matching function

Stochastic processes

- underlying process y
$$dy = -\gamma y dt + \sigma db$$
- db is a standard Brownian motion
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$$p = z + e^{y}(p^{*} - z)$$
- p^{*} is long-run average productivity
- it is always the case that $p > z$
- case 2: p is constant,
$$s = e^{-\sigma_y y} s^{*}$$
- $s^{*} > 0$ is long-run average separation rate

Calibration

- $p^* = 1$: normalization
- z: replacement ratio of 0.4
- β: bargaining power - Hosios condition
- α: estimate from matching function
- μ: average job-finding rate
- c: average $v - u$ ratio
- process for z: process for labor productivity
- process for x: process for separation rate in the data

Calibration

TABLE 2—PARAMETER VALUES IN SIMULATIONS OF THE MODEL

	Source of shocks	
Parameter	Productivity	Separation
Productivity p	stochastic	1
Separation rate s	0.1	stochastic
Discount rate r	0.012	0.012
Value of leisure z	0.4	0.4
Matching function $q(\theta)$	$1.355\theta^{-0.72}$	$1.355\theta^{-0.72}$
Bargaining power β	0.72	0.72
Cost of vacancy c	0.213	0.213
Standard deviation σ	0.0165	0.0570
Autoregressive parameter γ	0.004	0.220
Grid size $2n + 1$	2001	2001

Note: The text provides details on the stochastic process for

Results

		u	v	v/u	f	z	x
data	std	0.190	0.202	0.382	0.118	0.020	0.075
	autocorr	0.936	0.940	0.941	0.908	0.878	0.733
shocks to p	std	0.009	0.027	0.035	0.010	0.020	-
	autocorr	0.939	0.835	0.878	0.878	0.878	-
shocks to s	std	0.065	0.059	0.006	0.002	-	0.075
	autocorr	0.864	0.862	0.732	0.732	-	0.733

Additional points

- shocks to s
  - θ barely moves
  - u increases, v increases almost as much - positive correlation - contrary to the data between u and v

Role of wage determination

- wage equation

$$
\begin{aligned}
w &= (1-\beta)z + \beta(p + c\theta) \\
w - z &= \beta(p - z + c\theta)
\end{aligned}
$$

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  - increase in s slight decrease of θ
  - slight reduction of w
  - shorter employment duration but also lower wages: almost no impact on $v - u$

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- shocks to labor productivity
  - 1% increase in p increases θ by about 1%
  - net wage $w - z$ increases by about 1% as well
  - wage absorbs most of the benefit

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  - wage absorbs most of the benefit
- shocks to bargaining power
  - how much wage variability is needed to generate observed $v - u$ volatility?
  - mild counter-cyclical wages
  - observed volatility of the $v - u$ ratio
  - what exactly are these shocks to bargaining power?

Hall (2005)

Summary

- standard MP model
- very similar to Shimer(2005)
- labor productivity shocks
- different wage setting rules

Findings

- wage stickiness can resolve unemployment volatility puzzle
- amplification
  - wage stickiness increases response of $v - u$ ratio
- individual rationality
  - wage stickiness is consistent with wage stickiness

Model - notation

s	state
$\pi_{s,s'}$	probability of transition from s to s'
z_s	productivity at state s
x	exogenous separation probability
b	flow value of unemployment
$f(\theta), q(\theta)$	job-finding, vacancy-filling probability
c	vacancy costs
β	discount factor

Model - value functions

- U_s value of being unemployed and searching for a job

$$U_s = b + \beta \sum_{s'} \pi_{s,s'} \left[f(\theta_s)(w_{s'} + V_{s'}) + (1 - f(\theta_s)) U_{s'} \right] \tag{1}$$

- V_s value of being in a job after receiving the wage

$$V_s = \beta \sum_{s'} \pi_{s,s'} \left[(1 - x)(w_{s'} + V_{s'}) + x U_{s'} \right] \tag{2}$$

- J_s value of a job to the employer after the wage payments

$$J_s = z_s + \beta (1 - x) \sum_{s'} \pi_{s,s'} (J_{s'} - w_{s'}) \tag{3}$$

- $V_s = 0$ value of a vacancy, free entry condition

$$0 = -c + \beta q(\theta_s) \sum_{s'} \pi_{s,s'} (J_{s'} - w_{s'}) \tag{4}$$

Value functions

- from (4), as firms create more vacancies, θ rises and $q(\theta_s)$ decreases - until it drops to 0
- this determines θ_s
- conditional on wage, (3) determines value of a job to employer
- (4) then determines recruiting effort
- (1) and (2) do not directly affect the recruiting effort, but are needed to verify the wage lies in the bargaining set

Wage

- worker's reservation wage
$$\underline{w}_s = U_s - V_s$$
- employer's reservation wage
$$\bar{w}_s = J_s$$
- bargaining set
$$B_s = [\underline{w}_s, \bar{w}_s]$$
- any wage in the bargaining set is consistent with individual rationality
- Hall chooses $w_s = w^*$ for all states s and checks that $w^* \in B_s$ for all states s

Interpreting a constant-wage rule

- why would wage not change with productivity?
- "social norm": no wage cuts
- new part in Hall (2005): wage is constrained to be in the bargaining set
- key part: effect of wage stickiness on pre-match recruiting effort
- if only post-employment wage were sticky, and wages paid in the first period of employment fluctuated to offset anticipated later wages, the model would deliver much smaller fluctuations in labor-market conditions

Constant wage in a non-stationary environment

- what if productivity grows over time?
- wage cannot stay fixed at w
- consider following productivity process

$$z_t = z_t^P z_{s,t}^M$$

where

- z_t^P is slow-moving trend known to the public
- $z_{s,t}^M$ is mean-reverting process similar to the stationary environment
- analog to the constant wage rule

$$w_t = w z_t^P$$

Calibration and quantitative exercises

- productivity process: 5 values at $[1-\gamma, 1+\gamma]$
- transition matrix

$$\begin{aligned}\pi_{12} &= \pi_{45} = \pi_{21} = \pi_{54} = 2(1-\theta) \\ \pi_{23} &= \pi_{34} = \pi_{32} = \pi_{43} = 3(1-\theta)\end{aligned}$$

- 0 outside the diagonal, diagonal so that it sums up to 1
- the serial correlation is θ
- calibrate to monthly data

Results

TABLE 2—CALCULATIONS FROM JOLTS DATA

	December 2000	December 2002
New hires	4.070 million	3.187 million
Unemployed	5.264 million	8.209 million
Vacancies	4.036 million	2.558 million
Job-finding rate, ϕ	0.773 per month	0.388 per month
Job-filling rate, ρ	1.008 per month	1.246 per month
Unemployment rate, u	3.6 percent	5.7 percent
Vacancy rate, v	2.8 percent	1.8 percent
x	0.767 vacancies per unemployed worker	0.312 vacancies per unemployed worker
α, elasticity of job finding with respect to x	0.765	
ω, efficiency of matching	0.947	

source: Hall (2005)

Results

TABLE 3—PARAMETERS

Parameter	Interpretation	Value	Source
δ	Separation rate	0.034	JOLTS
λ	Flow value while searching (leisure or unemployment compensation)	0.4	Corresponds to a flow value while searching that is about 40 percent of the flow wage
k	Flow cost of a vacancy	0.986	Matches vacancy/unemployment ratio in median state to average, 2000–2002
β	Discount factor	0.995	Corresponds to 5-percent annual rate
θ	Serial correlation of mean-reverting component of productivity	0.9899	Serial correlation of U.S. unemployment, 1948–2003
γ	Dispersion parameter for mean-reverting component of productivity	0.00565	Matches standard deviation of unemployment to U.S. level of 1.54 percent

source: Hall (2005)

Results

TABLE 4—VALUES OF ENDOGENOUS VARIABLES IN THE MEDIAN STATE

Variable	Interpretation	Value
U	Value while searching	229.34
V	Value while working	229.28
J	Value of worker to the firm	1.8698
w	Wage	0.96572

source: Hall (2005)

Results

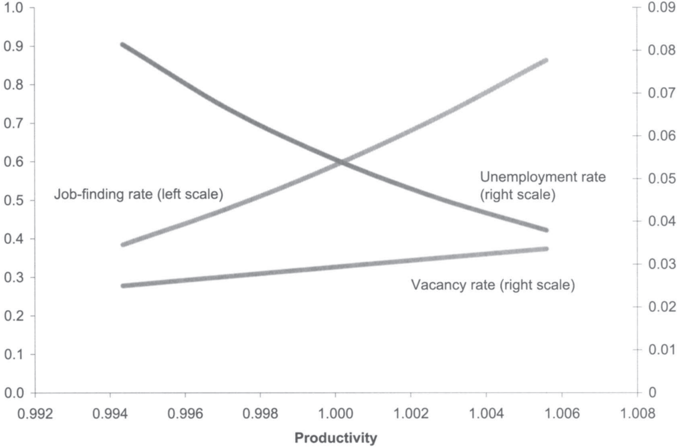

FIGURE 2. JOB FINDING, VACANCY, AND UNEMPLOYMENT RATES, FIXED WAGE

source: Hall (2005)

Results

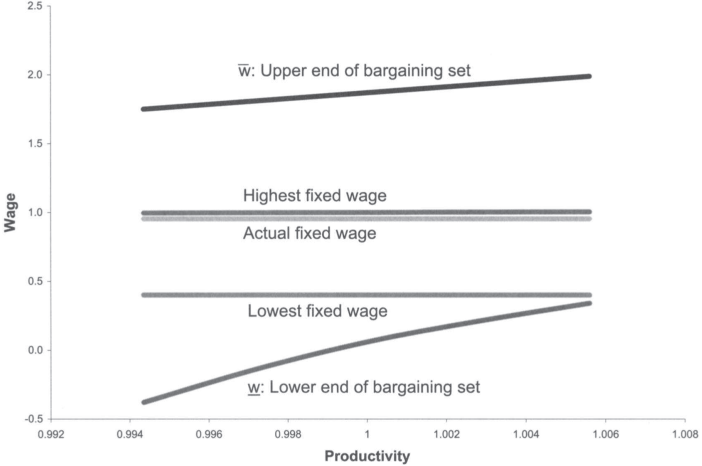

FIGURE 3. WAGE ELEMENTS

source: Hall (2005)

Results

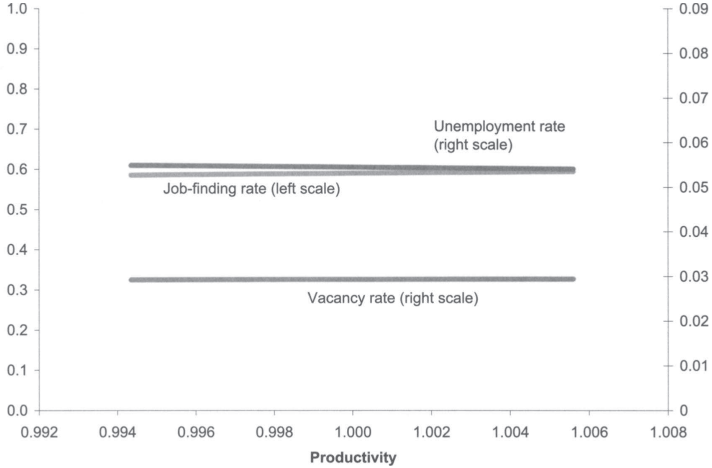

FIGURE 4. JOB FINDING, VACANCY, AND UNEMPLOYMENT RATES, NASH-BARGAIN WAGE

source: Hall (2005)

Quantitative exercises

- if productivity rises from stage z_3 to z_4
  - fixed-wage model: J rises 21 units per z
  - Nash bargaining: J rises 1.4 units per z
- amplification by a factor $21/1.4 = 15$

Quantitative exercises

- sensitivity of job creation/recruiting effort to z depends distribution of rents
    - the more rents employer gets, the more sensitive J is to z
- it also depends on difference between w and b (Hagedorn and Manovskii(2008))
- weak propagation mechanism:
    - persistence of slack conditions after a negative shock comes almost entirely from the persistence of low productivity
    - almost nothing comes from lower job-finding rates
    - constant wage rule is ad-hoc

Hagedorn and Manovskii (2008)

Summary

- they claim that model is poorly calibrated
- their calibration relies on (extreme) values of
    - bargaining power
    - value of leisure
- they target the fact that real wages do not react one for one with productivity in the US

$$\varepsilon_{\log w/\log y} = 0.449$$

Elasticity of the market tightness

- recall JC

$$\frac{c}{q(\theta)} = (1-\gamma)\frac{y-z}{\rho+\delta+\gamma p(\theta)} \quad \text{or} \quad \frac{\rho+\delta+\gamma p(\theta)}{q(\theta)} = (1-\gamma)\frac{y-z}{c}$$

- then

$$\frac{\partial\theta}{\partial y} = \frac{y}{y-z}\frac{\gamma p(\theta)+\rho+\delta}{\gamma p(\theta)+\varepsilon(\theta)(\rho+\delta)}$$

- they want to make y and z close to each other
- γ also increases elasticity
- final calibration:
  - bargaining power of a worker: $\gamma = 0.052$
  - value of leisure: $z = 0.955$ while $y = 1$

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- final calibration:
    - bargaining power of a worker: $\gamma = 0.052$
    - value of leisure: $z = 0.955$ while $y = 1$
- Ljunqvist and Sargent (2015) put everything nicely together

Calibration strategy

- value of leisure z

$$\frac{c}{q(\theta)} = J = \frac{y-z}{\rho+\delta}$$

- total vacancy posting costs depend on state of the economy, capital and labor costs

$$c_y = c^K y + c^W p^{0.449}$$

- use Silva and Toledo (2007) to set c^W; elasticity $\varepsilon_{\log w/\log y} = 0.449$ is the wage elasticity
- leads to set c lower than in Shimer (2005)
- they pick θ from the data: $f = 0.45, q = 0.71 \Rightarrow \theta = f/q = 0.634$
- choose z and γ to match θ and $\varepsilon_{\log w/\log y}$

Calibration strategy

- after Shimer (2005), elasticity of wages received a lot of attention
- $\varepsilon_{\log w/\log y}$ is targeted in the calibration
- $\varepsilon_{\log w/\log y}$: regress log-real wage on log-productivity
- wage equation implies that γ must be low if want a low elasticity

$$w = \gamma\left(y + c\theta\right) + \left(1-\gamma\right) z$$

Results

TABLE 3—SUMMARY STATISTICS, QUARTERLY US DATA, 1951:I TO 2004:IV

		u	v	v/u	p
Standard deviation		0.125	0.139	0.259	0.013
Quarterly autocorrelation		0.870	0.904	0.896	0.765
Correlation matrix	u	1	−0.919	−0.977	−0.302
	v	—	1	0.982	0.460
	v/u	—	—	1	0.393
	p	—	—	—	1

TABLE 4—RESULTS FROM THE CALIBRATED MODEL

		u	v	v/u	p
Standard deviation		0.145	0.169	0.292	0.013
Quarterly autocorrelation		0.830	0.575	0.751	0.765
Correlation matrix	u	1	−0.724	−0.916	−0.892
	v	—	1	0.940	0.904
	v/u	—	—	1	0.967
	p	—	—	—	1

Hall and Milgrom (2008)

Summary

- new wage setting mechanism: alternating-offer bargaining
- compared to Nash bargaining, wages are less responsive to z
- generate larger response of u, v to shocks in z

Nash bargaining

- worker and firm meet - there are rents, how to split them?
- Nash bargaining: threat points
  - worker: becoming unemployed
  - firm: wait for another applicant
  - wage: weighted average of productivity in a job and value of unemployment

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- if a unit increase in z increases w by one unit - no change in firm's incentives to post jobs
- Nash bargaining solution is close to this

Alternating-offers bargaining

- different notion of disagreement payoff and outside option
- bargaining takes place over time
- parties alternate in making offers
- one party makes an offer, the other party can
  - accept
  - reject and make a counter-proposal
  - abandon bargaining for outside offer
- it is the disagreement payoff - not the outside option - that determines bargaining outcome (unless outside option is particularly favorable)

Alternating-offers bargaining: payoffs

- in equilibrium - no bargaining
- parties think through consequences of a sequence of offers and counteroffers and move immediately to an agreement
- no time and resources are wasted

Model

- same as Hall(2005)
- some changes in notation
- three calibrations
  - Nash bargaining with standard (i.e. Shimer) calibration
  - Nash bargaining with Hagedorn-Manovskii calibration
  - alternating offer bargaining: new parameters

Model

- value of being unemployed U_i

$$U_i = b + \frac{1}{1+r} \sum_{i'} \pi_{i,i'} \left[f\left(\theta_i\right) \left(W_{i'} + V_{i'}\right) + \left(1 - f\left(\theta_i\right)\right) U_{i'} \right]$$

- W_i - value of a wage contract, V_i - value of a being employed (after receiving the wage)
- value of being employed

$$V_i = \frac{1}{1+r} \sum_{i'} \pi_{i,i'} \left[sU_{i'} + (1-s) \left(V_{i'} + W_{i'}\right) \right]$$

- PV of worker's output over lifetime

$$P_i = p_i + \frac{1}{1+r} \sum_{i'} \pi_{i,i'} (1-s) P_{i'}$$

- free-entry condition

$$c = q\left(\theta_i\right) \left(P_i - W_i\right)$$

- in Nash bargaining solution

$$W_i = \beta P_i + (1-\beta) \left(U_i - V_i\right)$$

Alternating-offers bargaining

- one party makes an offer, other party can accept, reject and make a counter-offer, abandon bargaining
- abandon bargaining: outside offers
- firm: cost $\gamma > 0$ each time it makes counter-offer
- worker: gets benefit b while bargaining
- if joint
$$V_i + P_i > U_i + (\gamma - b)\,\frac{1+r}{r} \Rightarrow W_i < P_i$$
- $V_i + P_i$: joint payoff from the match
- $(\gamma - b)\,\frac{1+r}{r}$: capitalized flow of delaying agreement

Alternating-offers bargaining

- assume (temporarily) that a subgame perfect equilibrium is unique
- δ probability that match breaks during bargaining
- indifference condition for a worker when considering an offer W_i from a firm

$$W_i + V_i = \delta U_i + (1-\delta)\left[b + \frac{1}{1+r}\sum_{i'} \pi_{i,i'}\left(W'_{i'} + V_{i'}\right)\right]$$

- indifference condition for a firm when considering an offer W'_i from a worker

$$P_i - W'_i = (1-\delta)\left[-\gamma + \frac{1}{1+r}\sum_{i'} \pi_{i,i'}\left(P_{i'} - W_{i'}\right)\right]$$

- firms makes the first offer (assumption), worker always accepts
- W_i is higher than take-it-or-leave-it offer due to threat of rejecting and making a counter-offer by a worker

Solution for the wage

- wage is "somewhat complicated" but close to
- $$\frac{1}{2}\left(\mathbf{W}+\mathbf{W}'\right)=\frac{1}{2}\left\{\mathbf{P}+\left(\mathbf{I}-\frac{1-\delta}{1+r}\pi\right)^{-1}\left[\delta\mathbf{U}+(1-\delta)\left(z+\gamma\right)\iota\right]-\mathbf{V}\right\}$$
- $\mathbf{P},\mathbf{V}$: similar role as in Nash bargaining
- $\mathbf{U}$: decreased by δ; $\mathbf{U}$ responds to aggregate shocks
- $(z+\gamma)$: new term, does not respond to aggregate shocks
- δ small: higher weight on "disagreement payoff" than on "outside options"
- overall effect: lower response to productivity shocks

Calibration: c and δ

- Silva and Toledo(2007): 14 percent of quarterly pay per hire or 9.1 days of pay per hire
- daily probability of filling a vacancy: 4.7 percent

$$c = (4.7 \text{ percent}) \times (9.1 \text{ days of pay}) = 0.43 \text{ days of pay}$$

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$$c = (4.7 \text{ percent}) \times (9.1 \text{ days of pay}) = 0.43 \text{ days of pay}$$

- higher δ - lower volatility of unemployment
- choose to match volatility of unemployment
- $\delta = 4x$

Calibration: γ

- employer's cost of delay $\gamma = 0.23$ days of worker productivity per day of delay
- chosen to match steady state $u = 5.5\%$
- interpretation ?
  - costs of idle capital? but remember: in equilibrium, no delay occurs!
- alternatively, γ is the cost of formulating a counteroffer
- if a worker produces \$160 per day, then $\gamma = 0.23$ means \$37 to produce a counter-offer

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- if a worker produces \$160 per day, then $\gamma = 0.23$ means \$37 to produce a counter-offer
- this is a crucial parameter
- but only comes into play two steps off the equilibrium path
- first, a worker makes a counter-offer; second, the firm counter-offers the offer

How much u volatility can be attributed to z

- SD of unemployment is 1.5 percentage points per quarter
- regress u on productivity growth - save residuals
- SD of residuals is 1.34 percentage points per quarter
  - this is beyond reach
- what's left: $\sqrt{(1.5)^2 - (1.34)^2} = 0.68$
- appropriate target for the unemployment volatility drive only by productivity shocks

Results

TABLE 2—COMPARISON OF THREE MODELS

Measure	Our estimate	Model: Mortensen-Pissarides	Model: Hagedorn-Manovskii	Model: Credible bargaining
Flow value of non-work, z	0.71	Input 0.71	Output 0.93	Input 0.71
Worker's share of surplus		Output 0.54	Output 0.19	Output 0.54
Productivity component of unemployment volatility, standard deviation in percentage points	0.68	Output 0.17	Input[a] 0.68	Input 0.68
Labor supply elasticity	1.0	Input 1.0	Output 2.6	Input 1.0

source: Hall and Milgrom (2008)

Results

TABLE 3—RESPONSES TO CHANGES IN PRODUCTIVITY

	Slope with respect to P			Elasticity
	U	V	W	Unemployment rate
Nash bargaining, Mortensen-Pissarides calibration	1.14	0.30	0.93	−4.7
Nash bargaining, Hagedorn-Manovskii calibration	0.87	0.23	0.71	−19.1
Credible bargaining	1.20	0.32	0.69	−20.0

TABLE 4—DECOMPOSITION OF EFFECTS OF PRODUCTIVITY ON THE WAGE

	Slope of P's contribution to W via			Slope of W with respect to P
	P	U	V	
Nash bargaining, Mortensen-Pissarides calibration	0.54	0.52	−0.14	0.93
Nash bargaining, Hagedorn-Manovskii calibration	0.19	0.70	−0.18	0.71
Credible bargaining	0.50	0.35	−0.16	0.69

source: Hall and Milgrom (2008)

Summarizing

- BRW bargaining increases fluctuations in u
- outside option versus disagreement payoff
- BRW introduces new parameters
  - probability that job disappears during bargaining
  - disagreement costs to the employer
  - no direct evidence, off-equilibrium, hard to calibrate
- other key parameters shared by all models
  - value of non-work
  - flow cost of maintaining vacancy
  - elasticity of job-finding rate wrt θ

Ljungqvist and Sargent (2015)

Preliminaries

- recall the job creation equation

$$y - z = \frac{\rho + \delta + \gamma \theta q(\theta)}{(1-\gamma) q(\theta)} c$$

- elasticity of the matching function

$$\varepsilon(\theta) = \frac{-\theta q\prime(\theta)}{q(\theta)}$$

- implicit differentiation of JC yields

$$\eta_{\theta,y} = \frac{(\rho + \delta) + \gamma \theta q(\theta)}{\varepsilon(\theta)(\rho + \delta) + \gamma \theta q(\theta)} \frac{y}{y - z} \equiv \Upsilon^{Nash} \frac{y}{y - z}$$

- Υ^{Nash} – can be bounded based on reasonable calibration
- $(y - z)$ – fundamental surplus: productivity minus quantity that cannot be allocated to job creation
- many models can be summarized into these two terms

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- Shimer (2005)
    - Υ^{Nash} close to 1
    - factor $y/(y-z)$ is important: but in Shimer's calibration, it is too low to explain data

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- Hall and Milgrom (2008)
  - fundamental surplus – subtract z and costs of delay $\tilde{\beta}\gamma$

Comments on wage stickiness

Wage stickiness

- wages are insufficiently responsive to shocks or economic conditions compared to some theoretical benchmark
- "under-responsiveness" of wages can have important implications for allocation of resources, efficiency and welfare
- what is the benchmark? it is context-specific
  - wages that decentralize social planner's solution
- what if there is investment into human capital or asymmetric information?
- regardless of the precise definition, there is a notion that if wages were more flexible, resource allocation would be better
- mapping between theoretical notion and empirical measures is not easy
  - example: incentives to increase vacancies in MP model depends on the expected PDV of net-of-wage profits.... not the easiest thing to measure

Why study wage stickiness?

- it amplifies response to shocks in MP model
- powerful example in Hall(2005)
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- firm sometimes (often?) rely on layoffs rather than wage cuts to reduce costs
- understanding wage stickiness is an important macro agenda
- so is developing and testing theories of wage stickness...