Reservation Wages and the Wage Flexibility Puzzle

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Introduction

- Wages are not very responsive to the business cycle
  - Unemployment elasticity of wages: -0.1 (Blanchflower and Oswald 1994)
- The search-and-matching labor market model struggles to quantitatively replicate these results
  - most suggested fixes alter model of wage determination - e.g. infrequent wage negotiation (Hall 2005, Pissarides 2009, Haefke et al 2008), backward-looking wages (Gertler and Trigari, 2009)
- This paper argues that the search behavior of the unemployed (reservation wages) has important implications for wage cyclicality
- Focus on reservation wages sheds light on puzzle

Contributions

1. Three puzzles (wage flexibility, reservation wage flexibility, relative flexibility)
   - 20+ years of reservation wage data from UK & Germany
   - Existing model alterations don't solve puzzles
2. Introduce behavioral aspect in job search
   - Empirical evidence for reference dependent job search
   - Model matches data if allow for "realistic" job search
3. Derive "wage curve" to analyze "Shimer puzzle" ($w(p) \leftrightarrow w(u)$)
   - Avoids productivity measurement problem (Rogerson & Shimer 2011)
   - Links puzzle to large empirical literature

The Model

Standard DMP search and matching model with two extensions:

1. Infrequent wage negotiation (à la Calvo 1983, Gertler & Trigari 2009)
   - Sticky wage for $1 - \alpha$ new hires and $1 - \phi$ continued contracts
   - Denote renegotiated wages (w_r), old wage (w_a)
   - Allows for *infrequent* wage negotiation and backward-looking elements
2. Allow for backward looking reservation wage ρ

$$\rho(t) - \rho^* = \alpha_\rho[\rho^o(t) - \rho^*] + (1 - \alpha_\rho)[\alpha_l w(t) - w^*] \qquad (1)$$

- Nests DMP model if $\alpha_\rho = \alpha = \phi = 0$

Cyclicality of model

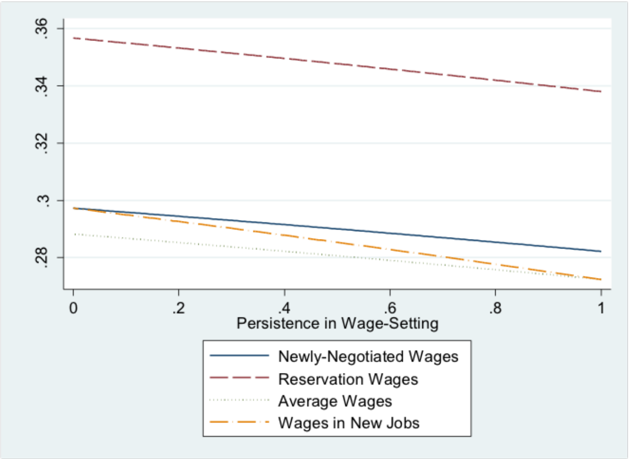

Figure: Cyclicality with different levels of 1-α and no persistence in reservation wage. Calibrated to monthly data using *UK data*

The newly negotiated wage

- Optimal reservation wage $\rho^o(t)$ such that $W(t;\rho^o(t)) = U(t)$
- Combine with rent-sharing condition:

$$w_r(t) = \rho(t) + \widetilde{\beta}\left[\mu(t) - (1-\alpha)(w_a(t) - w_r(t))\right]$$

w_r : re-negotiated wage
μ : hiring cost
w_a : average wage
ρ : reservation wage
α : renegotiation probability
$\widetilde{\beta}$: bargaining power

value functions

Key model predictions

1. Wage elasticity: $\epsilon_{w_a} \in (-0.27, -0.30)$
2. Reservation wage elasticity 20% higher: $\epsilon_{\rho} \approx 1.2 * \epsilon_{w_a}$
3. α makes little difference because unemployment very persistent

Cyclicality in the data

According to the search model wages depend on productivity and outside options, proxied by the unemployment rate

$$\ln w_{iat} = \alpha x_{iat} + \beta \ln u_{at} + d_a + d_t + d_i + \varepsilon_{iat}$$

Wages

- We replicate estimates in the literature on the same data as reservation wage (Blanchflower Oswald 1994, Gregg Machin Salgado 2014, among others)
- BHPS (1991-2009) for UK, SOEP (1987-2010) for Germany.

Reservation wages

- Little prior analysis of reservation wage cyclicality due to scarcity of data over full business cycle
- Estimate reservation wage cyclicality analogue to wage curve regressions
- Produce battery of tests to ensure reliability of reservation wage data

Wage equations: summary

- UK: all jobs, wage elasticity -0.17
- new jobs: between $(-0.13, -0.22)$
- specifications with regional unemployment $(-0.05, -0.08)$
- results for Germany:
  -0.03 on all jobs (max);
  $(-0.11, 0)$ on new jobs;
  $\simeq 0$ with regional unemployment
- *All way out of predicted range* $(-0.27, -0.3)$

Detail

replacement rate

Quality of reservation wage data

- From reservation wage equations: all human capital indicators and benefits have expected impact on reservation wages
- Next assess whether correlation between reservation wages and
  - remaining unemployment duration;
  - post-unemployment wages

  is in line with model predictions

Quality of reservation wage data (UK)

	Whether found job at $t+1$			Post-unemp wage		
	1	2	3	4	5	6
$\ln \rho_t$	**0.001** (0.008)	**−0.020**** (0.008)	**−0.020*** (0.011)	**0.436***** (0.021)	**0.312***** (0.036)	**0.157***** (0.080)
year dummies	yes	no	no	yes	no	no
trend	no	t, t^2	t, t^2	no	t, t^2	t, t^2
controls	no	yes	yes	no	yes	yes
person FE	no	no	yes	no	no	yes
Obs.	15278	14701	10642	2685	2594	2602

Sample: (1)-(3): nonemployed males and females 18-65; (4)-(6) with nonmissing wages at $t+1$, 1991-2009. Controls: gender, quadratic in age, educ (4 groups), cubic in duration, married, children, log benefits, region dummies. ***sig at 1%; **sig at 5%; *sig at 10%.

Germany

Reservation wage equations for the UK

Dep var: log hourly reserv. wage		
	1	2
ln u_t	$-\mathbf{0.175}^{***}$	$-\mathbf{0.164}^{**}$
	(0.058)	(0.040)
trend	t, t^2	t, t^2
person FE	no	**yes**
Obs.	14874	10774

Sample: nonemployed males and females 18-65; 1991-2009. Dep var: log real hourly reservation wage. Other controls: gender, quadratic in age, educ (4 groups), cubic in duration, married, children, log benefits, region dummies. s.e. clustered at the year level. ***sig at 1%; **sig at 5%; *sig at 10%.

Germany

Summary of theory and evidence

1. Wage cyclicality too large in model (wage flexibility puzzle)
2. Reservation wages cyclicality too large in model (reservation wage puzzle)
3. Reservation wages not more cyclical than new wages in data. (relative cyclicality puzzle)

$\rightarrow$ suggest that the determination of reservation wages in a search model is flawed

Explaining the puzzles

Reference point in job search

- Reference-dependent preferences shown to influence decision making including labor supply (Faber 2008)
- Reservation wage shaped by previous experience
  - Peer group (Akerlof (1980), Akerlof & Yellen (1990))
  - Past experience (Falk et al (2004), Katz & Blanchard (1999), DellaVigna et al (2016))
- We develop an empirical test for backward looking reservation wages
- Allow for refrence point dependent reservation wage in model

Model with refrence point in reservation wage

Possible model adjustment to account for reference points in reservation wages:

- Allow for backward looking reservation wage ρ

$$\rho(t) - \rho^* = \alpha_\rho[\rho^o(t) - \rho^*] + (1 - \alpha_\rho)[\alpha_I w(t) - w^*]$$

Empirical evidence for reference points

- Empirical reservation wage model:

$$\ln \rho_{it} = \beta_1 X_{it} + \beta_2 \ln w_{it-d_i} + \varepsilon_{it} \tag{2}$$

  where w_{it-d_i} is wage in last job held, lost d_i years ago

- w_{it-d_i} includes components of both worker ability (w_i^*) and rents (R_{it-d_i}):

$$\ln w_{it-d_i} = \gamma_1 X_{it-d_i} + \gamma_2 R_{it-d_i} + w_i^* + u_{it-d_i}$$

- Identification of reference point effect in (2) requires a proxy for past rents, which is orthogonal to worker ability.

Proxy for rents

- Use industry affiliation as a proxy for the size of rents in a job
  - long-established literature (eg Krueger and Summers 1988)
- Use predicted industry-level wage - having controlled for (un)observables - as an instrument for previous wages in the reservation wage equation
- Exclusion restriction requires no wealth effects from previous wages
  - not much in sample used
  - but include controls for assets (home ownership and bank accounts)

Results: Reservation wages and rents - IV

Dep var: log hourly reservation wage			
	1	2	3
$\ln w_{it-d}$	$\mathbf{0.133}^{***}$	$\mathbf{0.149}^{***}$	$\mathbf{0.153}^{***}$
	(0.018)	(0.063)	(0.067)
$\ln w_{it-d} * d$			$-\mathbf{0.002}$
			(0.009)
person FE	no	**yes**	**yes**
Obs.	7732	5520	5520
$F-$stat[1]	908.9	53.7	53.7
$F-$stat[2]			64.2

IV in cols 1-2: predicted 4-digit industry wage differential. IV in col 3: predicted 4-digit industry wage differential, and its interaction with time since job loss.

Cyclicality of wages with persistent reservation wage

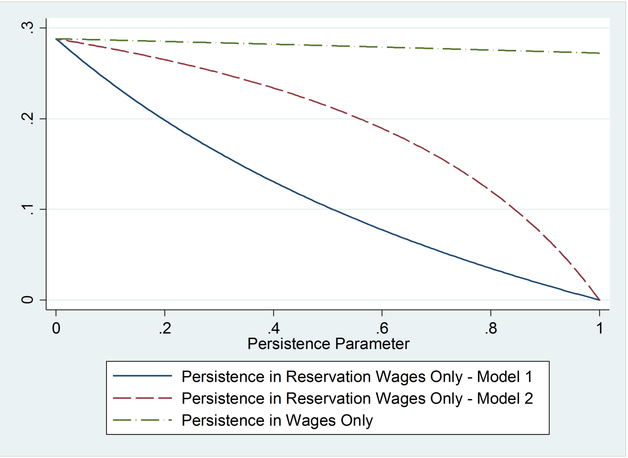

Figure: Cyclicality with different levels of persistance. Model 1 fixed refrence point, model 2 past wage refrence point.

Conclusions

- (lack of) Wage cyclicality is an enduring puzzle in labor/macroeconomics
- Under plausible assumptions, the reservation wage is the main cyclical component of wages
- Estimates show that reservation wages are as cyclical as actual wages, but not as cyclical as the model would predict
- Flaw in determination of reservation wage calls for alternative reservation wage models
- Alternative model: Rents in previous jobs are strong Models with fairness considerations have a better potential to explain lacking cyclicality

Additional slides

A numerical evaluation

- $u = 7\%$; $s = 0.0125$ (LFS). This implies $\lambda = 0.17$.
- $\xi = 0.003$ (from AR(1) unemployment persistence estimates)
- $\phi = 0.0833$ (wages negotiated once a year)
- $\beta = 0.05$ (Manning 2003)
- $r = 0.003$
- $\eta = 0.8$
- No data on α
- Obtain predicted wage elasticities for $0 \leq \alpha \leq 1$.

main

The Model: Firms

Value functions of firms

Value if searching

$$rV_t = -c_t + q_t\left[\alpha J_t(w_r(t)) + (1-\alpha) J_t(w_a(t)) - V_t - C_t\right] + E_t \dot{V}_t \quad (3)$$

Value if employing

$$rJ_t(\omega) = p_t - \omega - s\left[J_t(\omega) - V_t\right] + \phi\left[J_t(w_t) - J_t(\omega)\right] + E_t \dot{J}_t(\omega) \quad (4)$$

c_t : flow cost of recruitment
C_t : cost of employing
ϕ : probability of renegotiation
q_t : recruitment probability
s : probability of separation
$\dot{X}$: time derivative of X

main

The Model: Workers

Value functions of workers

Value if unemployed

$$rU_t = z + \lambda_t \left[\alpha W_t(w_r(t)) + (1-\alpha) W_t(w_a(t)) - U_t\right] + E_t \dot{U}_t \qquad (5)$$

Value if employed

$$rW_t(\omega) = \omega - s\left[W_t(\omega) - U_t\right] + \phi\left[W_t(w_r(t)) - W_t(\omega)\right] + E_t \dot{W}_t(\omega) \qquad (6)$$

λ_t : Probability of job finding

z : utility flow if unemployed

main

The Model: Solving the model

Assumptions

- We assume free entry

$$V_t = 0$$

- Wage negotations follow Nash bargaining (conventional rent sharing)

$$[rW_t(w_t) - rU_t]^{\beta}[rJ_t(w_t) - rV_t]^{1-\beta}$$

Simplifications

- Acyclical hiring cost

$$C_t = C$$

$$c_t = 0$$

- Shocks to λ_t follow an AR(1) process with persistence coefficient $\frac{1}{\varsigma}$

Link between reservation wage and wage

- Use *value functions* pin down $w_r(t), w_a(t)$ and $\rho(t)$
- Wage equation links reservation wage and wage

$$w_r(t) = \rho(t) + \overline{m} E_t J(t; w_r(t); w_a(t)) \tag{7}$$

$\rho(t)$: reservation wage at t, $w_r(t)$: renegotiated wage at t, $w_a(t)$: average wage at t, $J(t; w_r(t); w_a(t))$: value of a filled job at wage $w_r(t)$ and $w_a(t)$,

  - wages are mark-up over reservation wage, with the mark-up proportional to the expected value of a filled job

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- Reseration wage shaped by believe about future employment prospect

$$\rho(t) = z + E_t \int_t^\infty e^{-\int_t^\tau (r+\lambda(x)+s)dx}[(\alpha\lambda(\tau) - \phi)(w_r(\tau) - z) + (1-\alpha)\lambda(\tau)(w_a(\tau) - z)]d\tau \tag{8}$$

r: discount rate, α: hiring wage persistance, ϕ: employee wage persistance,

z: flow value of unemployment, s: separation rate, $\lambda(t)$: job offer rate at t,

Cyclicality of wages (Empirics)

- According to the search model wages depend on productivity and outside options, proxied by the unemployment rate

$$\ln w_{iat} = \alpha x_{it} + \beta \ln u_{at} + t + d_a + d_i + \epsilon_{iat}$$

Estimate:

- We replicate existing consensus on same data on which we estimate reservation wage equations, and allow for higher elasticity on new matches
- Elasticity of hourly wage with respect to national unemployment rate
- All matches versus new matches

main

Wage equations for UK: all jobs

	1	2	3	4	5	6
$\ln w_{it-1}$				0.759^{**} (0.005)	0.759^{**} (0.005)	0.759^{**} (0.005)
$\ln u_t$	-0.022 (0.032)	-0.165^{**} (0.044)	-0.155^{**} (0.043)	-0.123^{**} (0.017)	-0.106^{**} (0.025)	-0.125^{**} (0.017)
$\ln u_{t-1}$					-0.014 (0.020)	
$\ln u_{at}$						0.002 (0.009)
trend	t	$t,\ t^2$	$t,\ t^2$	$t,\ t^2$	$t,\ t^2$	$t,\ t^2$
trend$*a$	no	no	yes	no	no	no
Obs.	96270	96270	96270	70910	70910	70910
R^2	0.40	0.40	0.40	0.75	0.75	0.75

Sample: males and females 18-65; all jobs; 1991-2009.

Dep var: log real hourly wage. Other controls: gender, quadratic in age, educ (4 groups), cubic in tenure, married, children, region dummies.

OLS. s.e. clustered at the year level. **sig at 1%; *sig at 5%

Wage equations for UK: further specifications

	1	2	3	4	5	6
	New	Old	All	All	1st diff	FE
$\ln w_{it-1}$				0.759^{**}		0.134^{**}
				(0.005)		(0.019)
$\ln u_t$	-0.279^{**}	-0.116^{**}	-0.144^{**}	-0.123^{**}	-0.092^{**}	-0.053^{**}
	(0.077)	(0.038)	(0.040)	(0.017)	(0.021)	(0.016)
$\ln u_{start}$			-0.039^{**}	-0.003	0.004	
			(0.008)	(0.004)	(0.004)	
trend	$t,\ t^2$	$t,\ t^2$	$t,\ t^2$	$t,\ t^2$	$t,\ t^2$	$t,\ t^2$
Obs.	25517	70753	95584	70438	70438	70102
R^2	0.41	0.39	0.40	0.75	0.02	

Sample: males and females 18-65; 1991-2009.

Dep var: log real hourly wage. Other controls: gender, quadratic in age, educ (4 groups), cubic in tenure, married, children, region dummies.

s.e. clustered at the year level. **sig at 1%; *sig at 5%

Wage equations for Germany: all jobs

	1	2	3	4	5	6
$\ln w_{it-1}$				0.730^{**} (0.007)	0.730^{**} (0.007)	0.730^{**} (0.007)
$\ln u_t$	-0.097 (0.142)	-0.191 (0.145)	-0.171 (0.118)	-0.036^{*} (0.016)	0.020 (0.018)	-0.013 (0.018)
$\ln u_{t-1}$					-0.068^{**} (0.013)	
$\ln u_{at}$						-0.022 (0.015)
trend	t	$t,\ t^2$	$t,\ t^2$	$t,\ t^2$	$t,\ t^2$	$t,\ t^2$
trend$*a$	no	no	yes	no	no	no
Obs.	213693	213693	213693	164933	164933	164933
R^2	0.60	0.61	0.61	0.85	0.85	0.85

Sample: males and females 18-65; all jobs; 1987-2010.

Dep var: log real monthly wage. Other controls: log hours, gender, quadratic in age, educ (4 groups), cubic in tenure, married, children, region dummies.

s.e. clustered at the year level. **sig at 1%; *sig at 5%

Wage equations for Germany: further specifications

	1	2	3	4	5	6
	New	Old	All	All	1st diff	FE
$\ln w_{it-1}$				0.725^{**}		0.389^{**}
				(0.006)		(0.011)
$\ln u_t$	−0.344	−0.155	0.016	−0.023	-0.044^{**}	−0.007
	(0.170)	(0.138)	(0.023)	(0.014)	(0.015)	(0.005)
$\ln u_{start}$			-0.025^{**}	-0.008^{**}	−0.000	
			(0.007)	(0.002)	(0.002)	
trend	$t,\ t^2$	$t,\ t^2$	$t,\ t^2$	$t,\ t^2$	$t,\ t^2$	$t,\ t^2$
Obs.	34095	179333	196616	152183	152183	164933
R^2	0.66	0.58	0.61	0.75	0.05	

Sample: males and females 18-65; 1987-2010.

Dep var: log real monthly wage. Other controls: log hours, gender, quadratic in age, educ (4 groups), cubic in tenure, region dummies, married, children.

s.e. clustered at the year level. **sig at 1%; *sig at 5%

main

Reservation wage equations for Germany

Dep var: log hourly reserv. wage		
	1	2
$\ln u_t$	**0.173**** (0.070)	**0.038** (0.054)
trend	$t,\ t^2$	$t,\ t^2$
person FE	no	**yes**
Obs.	11221	7911

Estimation method: IV. Controls: gender, quadratic in age, three education dummies, cubic in duration, married, children, log benefits, desired hours, months of social insurance contributions and eleven region dummies. Unemployment benefits are instrumented by months to benefit expiry. Standard errors are clustered at the year level. ***sig at 1%; **sig at 5%; *sig at 10%.

main

Cyclicality of reservation wages

- Information on reservation wages in BHPS for everyone out of work, looking for work, and willing to start work
- Question about:
  - "lowest take-home pay that one would consider accepting", and
  - "expected working hours for such lowest pay"
  - obtain a measure of hourly net reservation wage
- Information on reservation wages in SOEP elicited in monthly terms and not supplemented by information on expected hours
  - Estimate specifications for monthly reservation wages, controlling for whether an individual is looking for a full-time, part-time, or any job.
- Might be worried about quality of data but higher reservation wages are associated with higher wages in next job and longer durations

The reservation wages (Theory)

- Job search behaviour might help to explain the origin of wage stickiness
- We derive link between reservation wages and wages:

$$w_t = \rho_t + k$$

  - cyclicality in negotiated wages is driven by cyclicality in the reservation wage
- implied reservation wage cyclicality in steady state

$$\varepsilon_{\rho,u} = \frac{\partial lnw}{\partial ln\rho} = \frac{w}{\rho}\varepsilon_{w,u}$$

  - reservation wage should be more cyclical than new hire wage

Quality of German reservation wage data

	1	2	3	4	5	6
dep var:	whether found job at $t+1$			post-unemp wage		
$\ln \rho_t$	0.034^{**}	-0.067^{**}	-0.067^{**}	0.698^{**}	0.367^{**}	0.367^{**}
	(0.006)	(0.008)	(0.008)	(0.024)	(0.030)	(0.030)
$\ln u_t$		-0.093^{**}			-0.234^{*}	
		(0.029)			(0.113)	
$\ln u_{at}$			-0.032			-0.090
			(0.020)			(0.058)
year fe	yes	no	no	yes	no	no
trend	no	$t,\ t^2$	$t,\ t^2$	no	$t,\ t^2$	$t,\ t^2$
Obs.	17789	17789	17789	4718	4718	4718
R^2	0.01	0.07	0.07	0.20	0.31	0.31

Sample: (1)-(3): nonemployed males and females 18-65; (4)-(6) with nonmissing wages at $t+1$, 1987-2010.

Controls: gender, quadratic in age, educ (4 groups), cubic in duration, married, children, log benefits (IV), whether looking for FT, PT or any job, region dummies and dummies for for East Germany during first 3 years. s.e. clustered at the year level. **sig at 1%; *sig at 5%

Detailed regression output

	1	2
	United Kingdom	Germany
Dep. var.: log reservation wage		
Log aggregate unemployment rate	-0.175**	-0.009
	(0.058)	(0.064)
Female	-0.102**	-0.182**
	(0.011)	(0.013)
Age	0.033**	0.010**
	(0.002)	(0.003)
Age2 (/100)	-0.034**	-0.002**
	(0.002)	(0.000)
Lower secondary qualification	0.068**	-0.006
	(0.009)	(0.021)
Upper secondary qualification	0.157**	0.084**
	(0.011)	(0.018)
Higher education	0.352**	0.276**
	(0.013)	(0.025)
Married	0.042**	-0.041**
	(0.006)	(0.009)
No. kids in household	0.018**	0.001
	(0.004)	(0.004)
Log(Unemp benefits + 1)	0.004*	-0.001
	(0.001)	(0.003)
Observations	14847	17238
R-squared	0.249	0.359

Controlls: quadratic trend, cubic in the duration in current status, region dummies (determinates of unemp benefits and East dummies for first 3 years in Germany). Instrument for unemp benefits in Germany with time to expiry. Standard errors are clustered at the year level.
** sig at 1% * sig at 5 %

Quality of UK reservation wage data

	1	2	3	4	5	6
dep var:	whether found job at $t+1$			post-unemp wage		
$\ln \rho_t$	-0.001	-0.020^*	-0.022^*	0.436^{**}	0.312^{**}	0.308^{**}
	(0.008)	(0.008)	(0.007)	(0.021)	(0.036)	(0.037)
$\ln u_t$		-0.069			-0.216^*	
		(0.069)			(0.077)	
$\ln u_{at}$			-0.036			0.015
			(0.026)			(0.057)
year fe	yes	no	no	yes	no	no
trend	no	$t,\ t^2$	$t,\ t^2$	no	$t,\ t^2$	$t,\ t^2$
Obs.	15278	14701	14701	2685	2594	2594
R^2	0.02	0.08	0.09	0.22	0.30	0.30

Sample: (1)-(3): nonemployed males and females 18-65; (4)-(6) with nonmissing wages at $t+1$, 1991-2009.

Controls and clustering as above

main

Reservation wage equations: summary

- Cyclicality of reservation wages much lower than the model would predict
- Unemployment elasticity of reservation wages much below elasticity for new hires
- These estimates suggest that the determination of reservation wages in a search model is flawed

Explaining the reservation wage puzzle

Potential changes to the conventional reservation wage model

1. Misspecified wage bargaining process
2. On the job search
3. Hyperbolic discounting
4. Refrence points in reservation wage formation

[Procyclical hiring costs and mark-up]

- Mark-up:

$$\mu(t) = \frac{\beta}{1-\beta}\left[\frac{c(t)}{q(t)} + C(t)\right]$$

- Vacancy duration $1/q(t)$ is procyclical, thus $\mu(t)$ is procyclical insofar as the flow cost of keeping an open vacancy is positive ($c(t) > 0$)
- But if vacancy costs are mainly independent of duration (selection, training, etc. - Pissarides 2009), $c(t) = 0$ and mark-up is acyclical
- What about if $c(t) > 0$ and mark-up is procyclical?

$$\frac{\partial \ln w}{\partial \ln u} = (1-\eta)\left(\frac{\partial \ln \mu(u)}{\partial \ln u} - \frac{s}{ru+s}\right)$$

- Procyclicality of hiring costs $\left(\frac{\partial \ln \mu(u)}{\partial \ln u} < 0\right)$ requires an even higher value of η to match a given elasticity of wages to unemployment.

Alternative explanations: Search on-the-job

- Alternative search model: workers search both off- and on-the-job and draw wage offers from a (posted) wage distribution $f(w)$
- Reservation wage in steady state (Burdett Mortensen 1998):

$$\rho = z + (\lambda^u - \lambda^e) \int_\rho \frac{1 - F(w)}{r + s + \lambda^e[1 - F(w)]} dw$$
$$\simeq z + (1 - u) \left(1 - \frac{\lambda^e}{\lambda^u}\right) [\overline{w} - z] \qquad (\text{for } r \to 0)$$

- This model generates acyclical reservation wages whenever $\lambda^u = \lambda^e$, as $\rho = z$.
- Taking or leaving an offer has no consequences for future job opportunities so one takes the first offer that offers more than instantaneous utility while unemployed
- The drawback is that if $\rho = z$ reservation wages do not respond to any individual covariate (eg human capital), while they clearly do.
- Also, evidence clearly shows $\lambda^u > \lambda^e$

Cyclicality with search on-the-job

$$\rho \simeq z + (1-u)\left(1 - \frac{\lambda^e}{\lambda^u}\right)[\overline{w} - z]$$

- $1-u$ is procyclical
- value and cyclicality of $1 - \lambda^e/\lambda^u$ can be inferred from data on the fraction of recruits from non-employment, according to:

$$\zeta = -\left[\frac{\lambda^e}{\lambda^u}\left(\frac{u}{1-u} + \frac{\lambda^e}{\lambda^u}\right)^{-1} \ln\left(1 + \frac{\lambda^e}{\lambda^u}\right)\right]$$

- ζ increases with u and falls with λ^e/λ^u
- Using data on ζ and u, the implied λ^e/λ^u is on average 0.6 and countercyclical
- Thus $1 - \lambda^e/\lambda^u$ is procyclical and this acts to make the reservation wage even more procyclical

Alternative explanations: Hyperbolic time preferences

- Discounting affects search behavior and reservation wages because of delayed returns to job search (Della Vigna and Paserman 2005)
- Hyperbolic discounting (high rates of short-time discounting) implies all else equal lower reservation wages
- This effect also reduces the procyclicality of reservation wages, but at the same time makes wages and reservation wages more weakly correlated

Steady state & Hagedorn, Manovski

- Obtain elasticity of w_r, w_a and reservation wages (ρ) to unemployment from value functions and wage setting
- Illustrate Hagedorn & Manovskii (2013)
- Current labor market conditions expected to last forever.

$$w = z + \widetilde{\beta}(r + s + \lambda)\mu$$

- Given $u = s/(s + \lambda)$:

$$w = z + \widetilde{\beta}\left(r + \frac{s}{u}\right)\mu$$

- Assume acyclical hiring costs, thus mark-up is acyclical.
- Wage-unemployment elasticity:

$$\frac{\partial \ln w}{\partial \ln u} = -\widetilde{\beta}\frac{\mu s}{wu} = -(1 - \eta)\frac{s}{ru + s}$$

where $\eta \equiv z/w$ is the replacement ratio.

- $s/(ru + s)$ close to 1. Thus $\partial \ln w/\partial \ln u \simeq -0.1$ requires $\eta \simeq 0.9$.

Cyclicality of wages (Theory)

- **Elasticity of wages**
  We can derive the wage elasticity $\varepsilon_{w,u}$ in steady state

$$\varepsilon_{w,u} = \frac{\partial \ln w}{\partial \ln u} = -(1-\eta^*)\frac{s}{s+ru^*}$$

  - η^* is the steady state replacement ratio