High Discounts and High Unemployment

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Workers separate from their jobs with monthly hazard $s = 0.035$

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$$J_1 = \frac{1}{1 + r_1}\{1 - w + (1 - s)[(1 - \pi_1)J_1 + \pi_1 J_2]\}$$

and similarly for J_2

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The solution is $J_1 = 1.29$ and $J_2 = 0.87$

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The market is in equilibrium when the cost of recruiting a worker equals the value of the worker:

$$cT_i = J_i$$

.

DMP continued

The job-finding rate is $f_i = \mu^2 T_i$, where μ is the efficiency parameter of the matching function. The stationary unemployment rate is

$$u_i = \frac{s}{s + f_i}$$

with $u_1 = 5.1$ percent and $u_2 = 7.4$ percent

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Conclusion

With an equilibrium sticky wage (Hall 2005), fairly large discount fluctuations result in realistic unemployment volatility

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Under the assumption of a Cobb-Douglas matching function with equal elasticities for unemployment and vacancies (hiring flow = $\mu\sqrt{UV}$), the vacancy-filling rate is

$$q = \mu\theta^{0.5}$$

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Discounting and the stochastic discount factor

Let Y_t be the market value of a claim to the current and future cash flows from one unit of an asset, where the asset pays off $\rho_\tau y_{t+\tau}$ units of consumption in current and future periods, $\tau = 0, 1, \ldots$

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The price is

$$Y_t = \mathbb{E}_t \, m_{t,t+1} y_{t+1} + \rho_2 \, \mathbb{E}_t \, m_{t,t+2} y_{t+2} + \cdots .$$

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Discount rates...

The *discount rate* for a cash receipt τ periods in the future is:

$$r_{y,t,\tau} = \left(\frac{\mathbb{E}_t \; y_{t+\tau}}{\mathbb{E}_t \; m_{t,t+\tau} y_{t+\tau}} \right)^{1/\tau} - 1.$$

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The value of the asset is

$$Y_t = y_t + \rho_1 \frac{\mathbb{E}_t \ y_{t+1}}{1 + r_{y,t}} + \rho_2 \frac{\mathbb{E}_t \ y_{t+2}}{(1 + r_{y,t})^2} + \dots$$

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Discount rates...

If y_t is a random walk,

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Given the current asset price Y_t and current cash yield, y_t, one can calculate the discount rate as the unique root of this equation

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The decline in the flow is the survival probability of a job—the probability ρ_τ that a worker will remain on the job τ periods after being hired and η_τ is the duration distribution, the probability that a job ends τ periods after it starts

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The survival probability is

$$\rho_\tau = \eta_{\tau+1} + \eta_{\tau+2} + \ldots$$

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Construct P directly

Take productivity equal to 1

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$$P(r) = P(r) = \frac{1}{1+r} + \rho_1 \frac{1}{(1+r)^2} + \rho_2 \frac{1}{(1+r)^3} + \cdots$$

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Options for $W(r)$

One natural approach would be to form the present value of the wage, $W(r)$, the same way, based on the observed wage

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Instead, I use a model of wage formation to construct the function

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Nash model of wage determination in original DMP

Shimer (2005) showed that Nash wage determination gave too much weight to conditions in the labor market

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Worker has a bargaining advantage if jobs are easy to find

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Flexible model to overcome problem with Nash

Rubinstein-Wolinsky (1985) alternating offer bargain

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Low δ disconnects wage from conditions; $\delta = 1$ is Nash

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Indifference conditions control counteroffers

Worker:

$$W_J + V = \delta U + (1-\delta)\left[z + \frac{1}{1+r}(W_E + V)\right]$$

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Average, generalization of Nash:

$$2W = W_J + W_E = \frac{1+r}{r+\delta}[\delta U + (1-\delta)(z+\gamma)x] + P - V$$

.

Solution

The Bellman equations for the unemployment value and the subsequent career value are:

$$U = z + \frac{1}{1+r}[\phi \cdot (W+V) + (1-\phi)U]$$

$$V = U\left[\eta_1 \frac{1}{1+r} + \eta_2 \frac{1}{(1+r)^2} + \dots\right]$$

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The discount rate is the unique solution to

$$J = P(r) - W(r)$$

Notice that this solution imposes the zero-profit condition $(P-W)q = c$ because $qJ = c$

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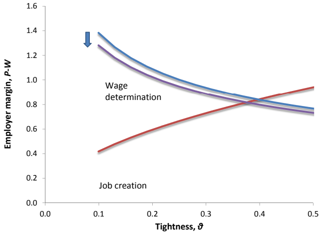
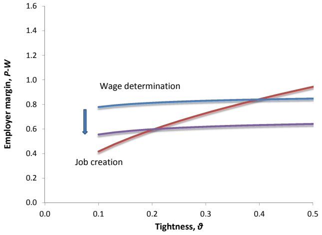
Graphical analysis of increase in discount rate





Nash: $\delta = 1$

Tightness-isolated: $\delta = 0.05$

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Relation between nonwork flow value and productivity

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Productivity shocks have no effect on tightness, even with sticky wages

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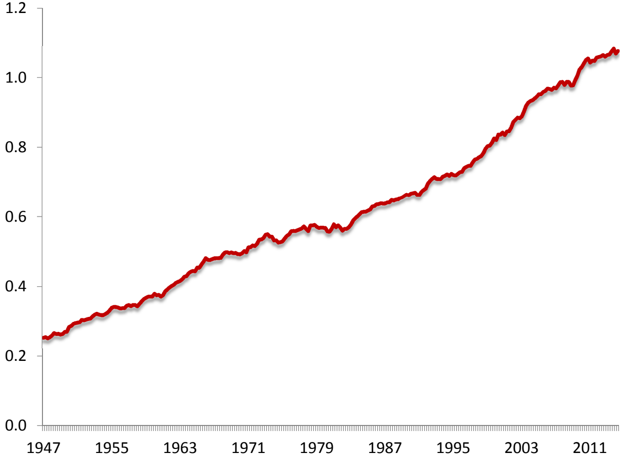
Output per Worker, U.S. Business



Statistical analysis

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The p value for the Dickey-Fuller test with a linear time trend is 0.98, indicating no perceptible evidence in favor of mean reversion

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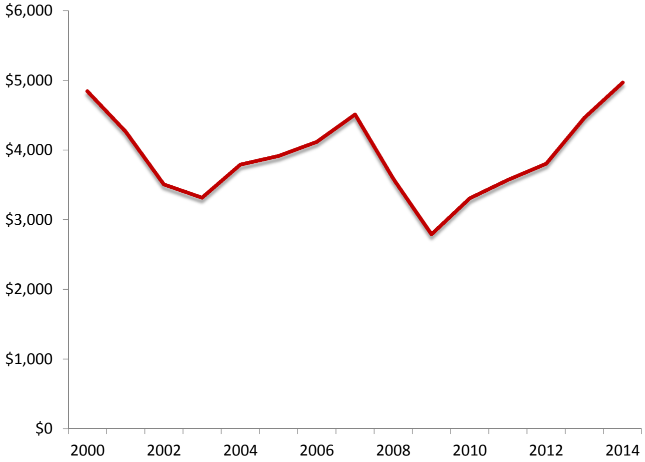
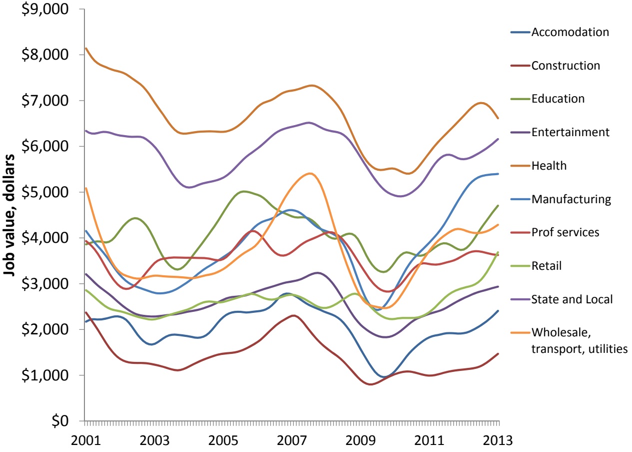
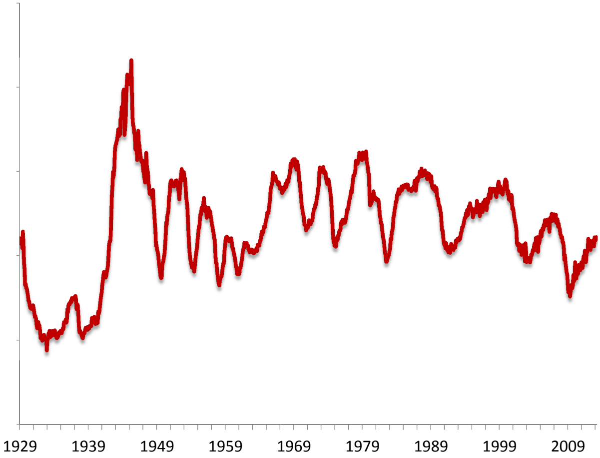
Aggregate Job Value, 2001 through 2013



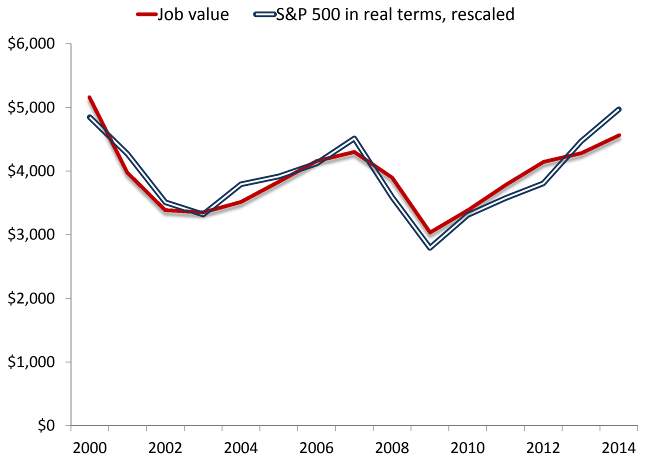
Job Values by Industry, 2001 through 2013



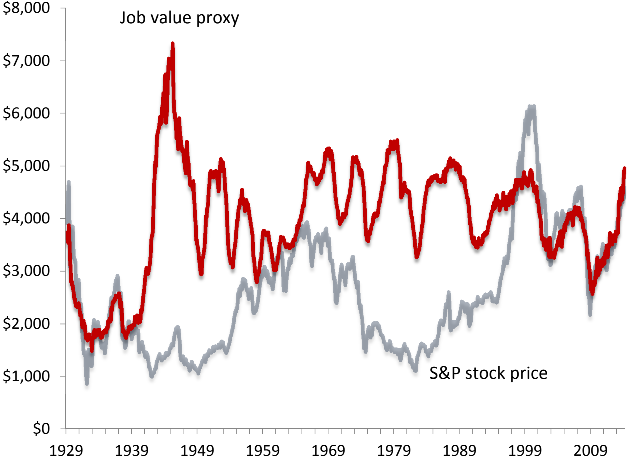
Proxy for the Job Value, 1929 through 2013



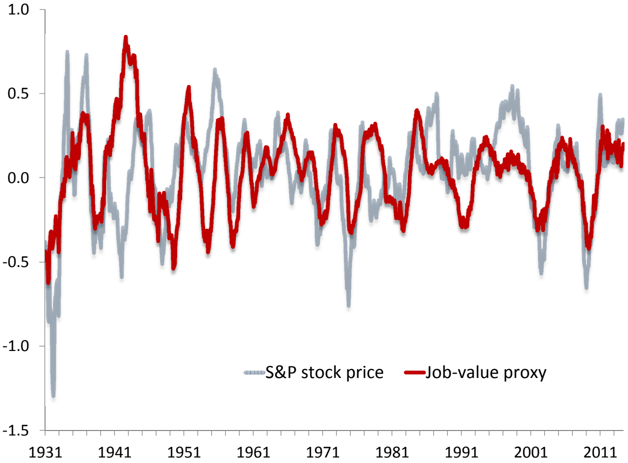
Job Value from JOLTS and S&P Stock-Market Index, 2001 through 2013



Job-Value Proxy and the S&P Stock-Market Index



Two-Year Log-Differences of the Job Value and the S&P Stock-Market Price Index



Opportunity cost of employment

$$z = b + \Delta c - \frac{\Delta U(c,h)}{\lambda}$$

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Chodorow-Karabarbounis (2014): $b = 0.04$; Pistaferri, et al. (2003): $\psi = 0.7$

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Chodorow-Karabarbounis (2014): $b = 0.04$; Pistaferri, et al. (2003): $\psi = 0.7$

$$z = 0.41$$

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Job Survival Probability Estimated from CPS Tenure Data Compared to Constant Separation Rate

Remaining calibration

$r = 0.10/12$. The average vacancy/unemploment ratio starting in 1948 is $\theta = 0.40$ and vacancy-filling rate is 1.39 hires per month per vacancy. I solve for matching efficiency $\mu = 0.88$, job-finding rate 0.55 per month. For $\delta < 1$, I choose γ to yield the same wage and other values as for $\delta = 1$, where γ is irrelevant.

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This calibration attributes much more search capital per unit of productivity than Shimer's standard calibration

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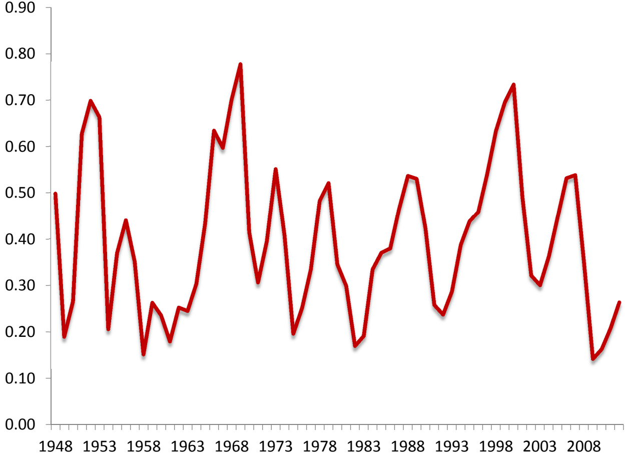
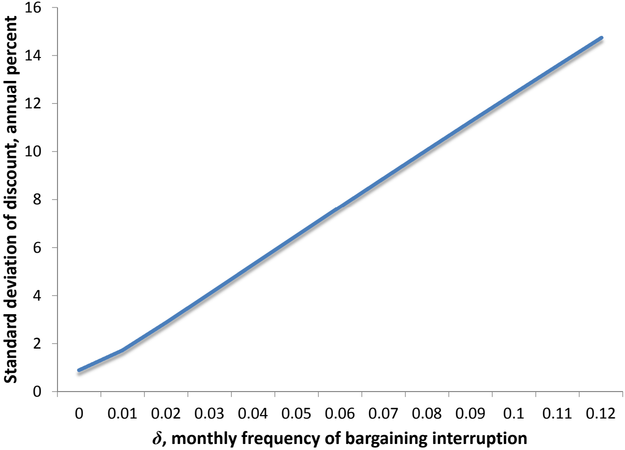
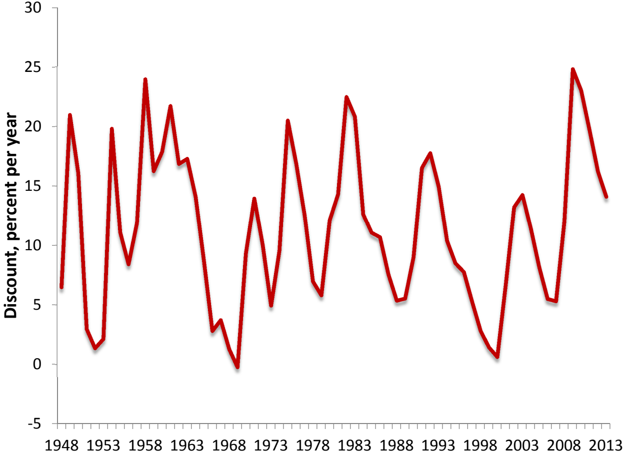
The Vacancy/Unemployment Ratio, θ, 1948 through 2012



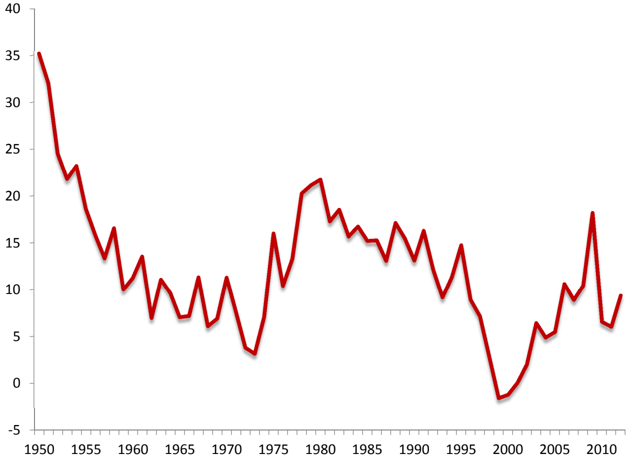
Standard Deviation of Implied Discount as a Function of Wage Flexibility, δ



Discount Rate for $\delta = 0.05$



Econometric Measure of the Discount Rate for the S&P Stock-Price Index



Discount for near-future dividends

$$r_t = \frac{\mathbb{E}_t \ \sum_{\tau=13}^{24} d_{t+\tau}}{p_t} - 1$$

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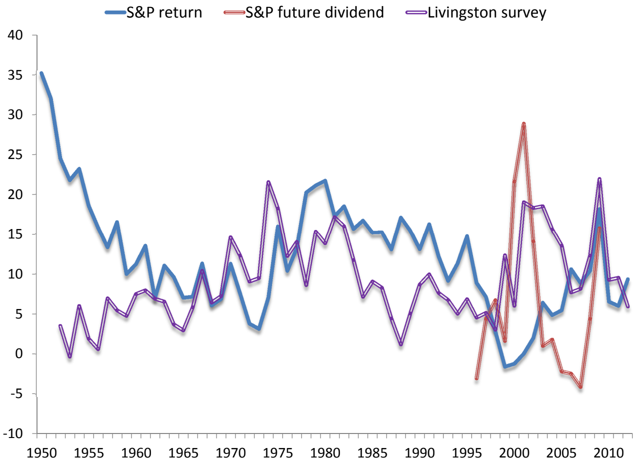
Three Measures of Discount Rates Related to the S&P Stock Price Index Portfolio



Correlations among the Three Measures of Discount Rates

Measures	*Correlation*	*Years*
Dividends, stock price	-0.32	1996-2009
Dividends, Livingston	0.37	1996-2009
Stock price, Livingston	-0.14	1952-2012

Correlations of the Discount Rate in the Labor Market with Stock-Market Rates

Measure	*Correlation with labor market*	*Years*
Dividends	0.10	1996-2009
Stock price	0.18	1950-2009
Livingston	0.30	1952-2012

Discount Rate for the Labor Market and the Livingston Panel's Rate for the Stock Market