

Involuntary Unemployment and the Business Cycle

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Background

- Much progress building DSGE models for the purpose of analyzing monetary policy.
- Benchmark model: basic goods, labor markets, monetary policy.
- Extensions:
 - financial frictions.
 - unemployment, labor force.

What We Do:

- We investigate a particular approach to modeling unemployment.
 - Hopenhayn and Nicolini (1997), Shavell and Weiss (1979)
- We explore the implications for monetary DSGE models.
 - Simple three equation NK model
 - NAIRU, Okun's gap, natural rate of unemployment.
 - Standard empirical NK model (e.g., CEE, SW)
 - Estimate the model.
 - Does well reproducing response of unemployment and labor force to three identified shocks.

Unemployment

- To be ‘unemployed’ in US data, must
 - be ‘willing and able’ to work.
 - make efforts to find a job.
- Empirical evidence: losing your job is a bad thing.
 - consumption drops typically about 10 percent upon the loss of a job (Gruber, 1997, Chetty and Looney, 2006)
 - Much discussion in the press about the hardship experienced by the unemployed in the current recession.
- Current monetary DSGE models with ‘unemployment’:
 - Utility **jumps** when you lose your job.
 - Finding a job requires **no** effort.
 - US Census Bureau employee dropped into current monetary DSGE models would find **zero unemployment**.

What we do:

- Explore the simplest possible model of unemployment, which satisfies the two key features of unemployment.
- To be unemployed:
 - Must have made recent efforts to find a job.
 - Assume households choose effort, e , which increases the probability, $p(e)$, of finding a job.
 - Transition from unemployment to employment makes you better off.
 - assume household search effort, e , is not publicly observable.
 - full insurance against household labor market outcomes is not possible.
 - under perfect consumption insurance, no one would make an effort to find a job.

Outline

- Insert our model of unemployment into
 - Simple Clarida-Gali-Gertler (CGG) NK model.
 - CEE model: evaluate model's ability to match US macroeconomic data, including unemployment and labor force

CGG Model

- Goods Production:

$$Y_t = \left[\int_0^1 Y_{i,t}^{\frac{1}{\lambda_f}} di \right]^{\lambda_f}, \quad 1 \leq \lambda_f < \infty.$$

- Monopolists produce intermediate goods

- Technology:

$$Y_{i,t} = A_t h_{i,t}$$

- Calvo sticky prices:

$$P_{i,t} = \begin{cases} P_{i,t-1} & \text{with prob. } \xi_p \\ \text{chosen optimally} & \text{with prob. } 1 - \xi_p \end{cases}$$

- Enter competitive markets to hire labor.

CGG Model: Monetary Policy

- Taylor rule:

$$\hat{R}_t = \rho_R \hat{R}_{t-1} + (1 - \rho_R)[r_\pi \hat{\pi}_t + r_y \hat{x}_t] + \varepsilon_t$$

- Here:
 - $\hat{x}_t$ output gap (percent deviation of output from natural output)
- Natural equilibrium:
 - Monopoly power and inflation distortions extinguished.

Households

- This is where the new stuff is.....

Typical Household During Period

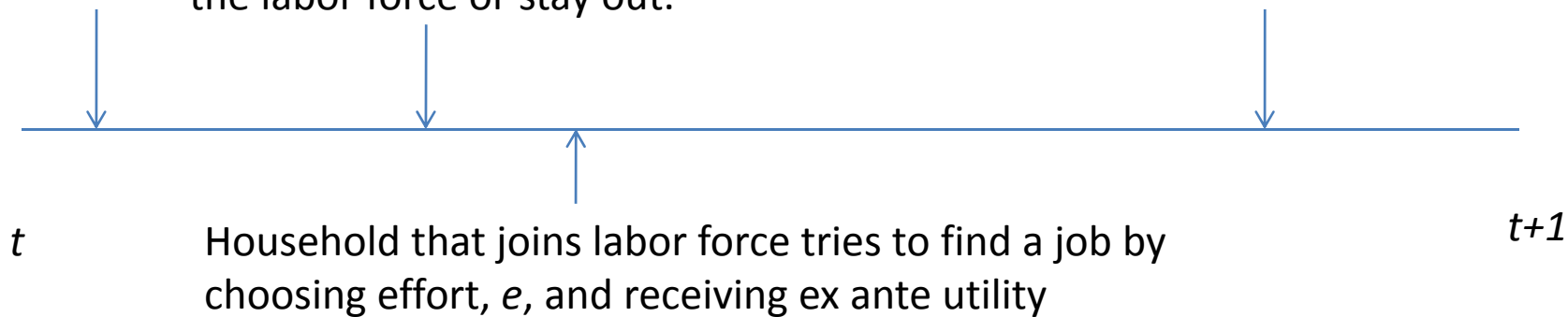
Draw privately observed, idiosyncratic shock, l , from Uniform, $[0, 1]$, that determines utility cost of work:

$$F + \varsigma_t(1 + \sigma_L)l^{\sigma_L}.$$

After observing l , decide whether to join the labor force or stay out.

Household that stays out of labor market does not work and has utility

$$\log c_t^{\text{out of labor force}}$$



$$p(e_t) \left[\overbrace{\log(c_t^w) - F - \varsigma_t(1 + \sigma_L)l^{\sigma_L} - \frac{1}{2}e_t^2}^{\text{ex post utility in case household finds a job}} \right] + (1 - p(e_t)) \left[\overbrace{\log(c_t^u) - \frac{1}{2}e_t^2}^{\text{ex post utility in case of unemployment}} \right]$$

$$p(e_t) = \eta + ae_t$$

Household Insurance

- They need it:
 - Idiosyncratic work aversion.
 - Job-finding effort, e , may or may not produce a job.
- Assume households gather into large families, like in Merz and Andolfatto
 - With no private information:
 - Households with low work aversion told to make big effort to find work.
 - All households given same consumption.
 - Not feasible with private information.
 - With private information
 - To give households incentive to look for work, must make them better off in case they find work.

Optimal Insurance

- Relation of family to household standard principal/agent relationship.
 - family receives wage from working households
 - family observes current period employment status of household.
- For family with given C, h :
 - allocates consumption: c_t^w, c_t^u
 - c_t^w/c_t^u must be big enough to provide incentives.
 - must satisfy family resource constraint:

$$h_t c_t^w + (1 - h_t) c_t^u = C_t.$$

Family Indirect Utility Function

- Utility:

$$u(C_t, h_t,) = \log(C_t) - z(h_t, \varsigma_t),$$

- Where

$$z(h_t, \varsigma_t) = \log[h_t(e^{F+\varsigma_t(1+\sigma_L)}f(h_t, \varsigma_t)^{\sigma_L} - 1) + 1] \\ - \frac{a^2\varsigma_t^2(1+\sigma_L)\sigma_L^2}{2\sigma_L+1}f(h_t, \varsigma_t)^{2\sigma_L+1} - \eta\varsigma_t\sigma_L f(h_t, \varsigma_t)^{\sigma_L+1}.$$

Family Problem

$$\max_{\{C_t, h_t, B_{t+1}\}} E_0 \sum_{t=0}^{\infty} \beta^t [\log(C_t) - z(h_t, \varsigma_t)]$$

– Subject to:

$$P_t C_t + B_{t+1} \leq B_t R_{t-1} + W_t h_t + \textit{Transfers and profits}_t.$$

- Family takes market wage rate as given and tunes incentives so that marginal cost of extra work equals marginal benefit:

$$C_t z_h(h_t, \varsigma_t) = \frac{W_t}{P_t}.$$

Observational Equivalence Result

- Because of the simplicity of the assumptions, the model is observationally equivalent to standard NK model, when represented in terms of output, interest rate, inflation:

$$\hat{\pi}_t = \beta E_t \hat{\pi}_{t+1} + \frac{(1-\beta\xi_p)(1-\xi_p)}{\xi_p} (1 + \sigma_z) \hat{x}_t$$

$$\hat{x}_t = E_t \hat{x}_{t+1} - (\hat{R}_t - \hat{\pi}_{t+1} - \hat{R}_t^*).$$

$$\hat{R}_t = \rho_R \hat{R}_{t-1} + (1 - \rho_R) [r_\pi \hat{\pi}_t + r_y \hat{x}_t] + \varepsilon_t,$$

Unemployment Gap

- Can express everything in terms of unemployment gap:

$$u_t^g = -\kappa^{okun} \hat{x}_t. \quad \kappa^{okun} = \frac{a^2 \zeta \sigma_L^2 m^{\sigma_L} (1-u)}{1-u + a^2 \zeta \sigma_L^2 m^{\sigma_L}} > 0.$$

$$u_t^g = \overbrace{u_t}^{\text{actual unemployment}} - \overbrace{u_t^*}^{\text{natural rate of unemployment}}$$


Non-accelerating inflation rate of unemployment, NAIRU

Unemployment Gap

$$\hat{\pi}_t = \beta E_t \hat{\pi}_{t+1} - \kappa u_t^g$$

$$u_t^g = \kappa^{okun} E_t u_{t+1}^g + \kappa^{okun} (\hat{R}_t - \hat{\pi}_{t+1} - \hat{R}_t^*)$$

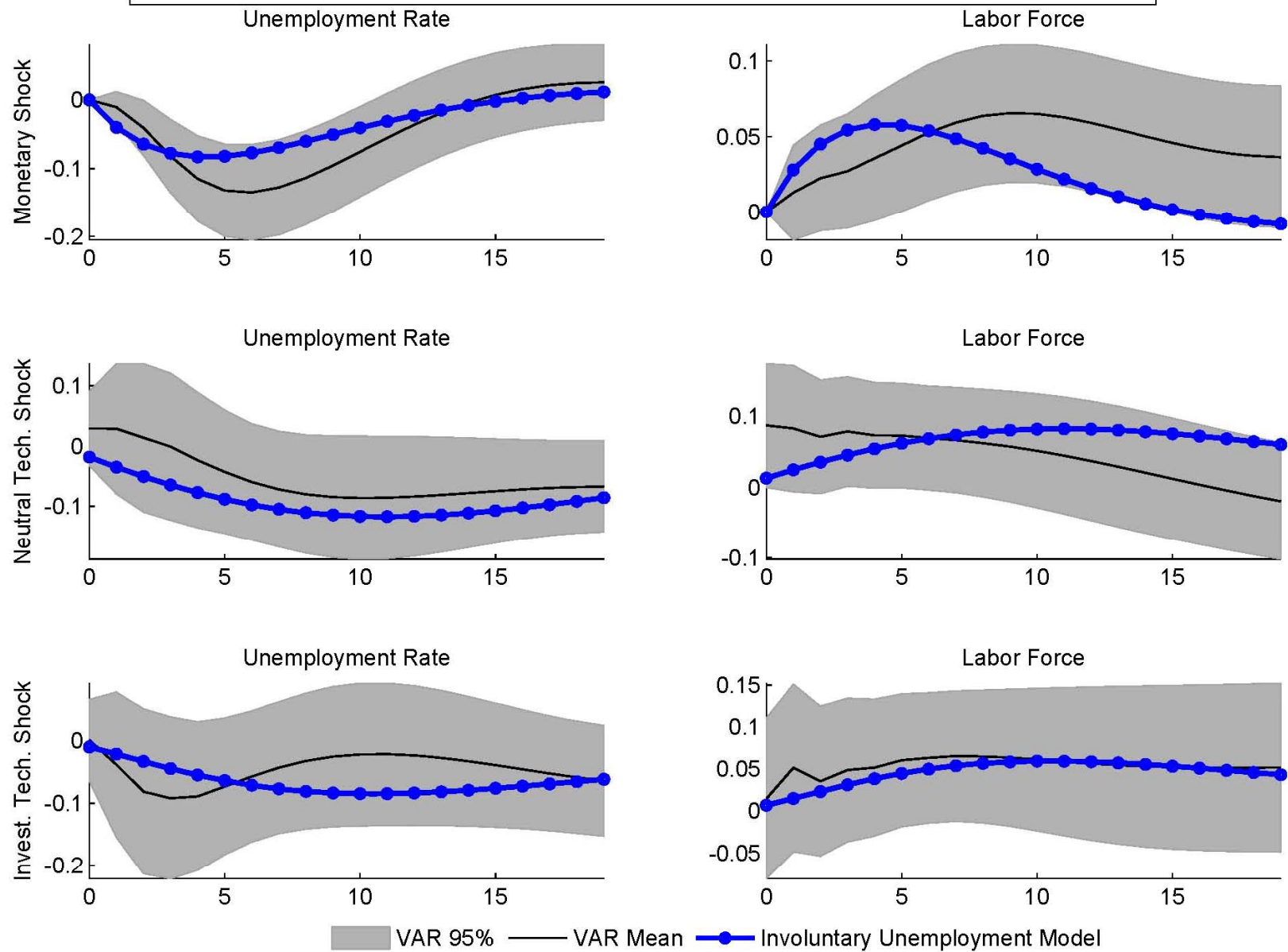
$$\hat{R}_t = \rho_R \hat{R}_{t-1} + (1 - \rho_R) \left[r_\pi \hat{\pi}_t - \frac{r_y}{\kappa^{okun}} u_t^g \right] + \varepsilon_t$$

$$\kappa \equiv \frac{(1 - \beta \xi_p)(1 - \xi_p)}{\xi_p} \frac{1 + \sigma_z}{\kappa^{okun}}$$

Put this all into a big DSGE Model

- Habit persistence in preferences
- Variable capital utilization.
- Investment adjustment costs.
- Wage setting frictions as in Erceg-Henderson-Levin.

Figure 4: Dynamic Responses of Labor Market Variables to Three Shocks



Questions Raised by Analysis

- Is consumption (utility) inequality between employed and non-employed bigger in booms?
 - what evidence we have is on the cross-section variance of consumption, not consumption premium across employed and unemployed.
- Does higher unemployment in recessions reflect reduced search intensity?
 - discouraged workers: people ‘available to work’ but are not currently looking because they think there are no jobs.
 - number jumped 70 percent, 2008Q1 to 2009Q1.

Conclusion

- Integrated a model of ‘involuntary unemployment’ into monetary DSGE model.
- Results:
 - Obtained a theory of the NAIRU
 - Able to match responses of unemployment and labor force to macro shocks.