Labor Turnover Costs, Workers’ Heterogeneity, and Optimal Monetary Policy

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Introduction

• Does monetary policy face severe short-run tradeoffs? What is the role of labor markets in this context?
• Standard model have “divine coincidence” property.
• However, this only holds under neoclassical labor markets.
• We use a model with heterogeneous idiosyncratic productivity and labor turnover costs (see Lechthaler, Merkl, and Snower, 2008).
• The “divine coincidence” disappears. Monetary policy faces endogenous cost-push shocks.
• The optimal volatility of inflation is an increasing function of the firing costs.
Motivation: Output Volatility in the Eurozone

![Graph showing the relationship between employment protection legislation index and output volatility in the Eurozone. The graph includes data points for countries such as Ireland, Finland, Germany, Netherlands, France, Spain, Portugal, Austria, Belgium, and Greece. The equation of the regression line is given as: \( R^2 \text{ of the regression: } 0.48 \) \( \text{Significance: 0.0175} \)]
Inflation Volatility in the Eurozone

R² of the regression: 0.48
Significance: 0.0178
Agenda

• Description of the Model
• Calibration
• Unconstrained Ramsey
• Optimal Simple Rule
• Conclusion
Utility function:

\[ U_t = \sum_{j=t}^{\infty} \beta^{j-t} E_t \frac{C_j^{1-\sigma}}{1-\sigma} \]

Budget constraint:

\[ Bo_t + c_t P_t - T_t = W_t N_t + B_t U_t + (1 + i_{t-1}) Bo_{t-1} + \Pi_{a,t} \]

Euler consumption equation:

\[ c_t = \beta E_t c_{t+1} \left( \frac{(1 + i_t)}{\pi_{t+1}} \right)^{-\frac{1}{\sigma}} \]

Consumption pooling, large family assumption (as in Krause and Lubik 2007 and others).
The Labor Market: Hiring and Firing

\[ \tilde{\Pi}_{I,t}(\varepsilon_t) = a_t m c_t - w_t - \varepsilon_t + \]
\[ + E_t \left\{ \sum_{j=t+1}^{\infty} \Delta_{t,j} \left[ (1 - \phi_j)^{j-t} \left( a_j m c_j - w_j - \left( \frac{1}{1 - \phi_j} \int_{-\infty}^{v_{t,j}} \varepsilon_j g(\varepsilon_j) d\varepsilon_j \right) \right) - \phi_j f_j (1 - \phi_j)^{j-t-1} \right] \right\} \]

\[ h_t = a_t m c_t - w_t - \nu_{h,t} + \]
\[ + E_t \left\{ \sum_{j=t+1}^{\infty} \Delta_{t,j} \left[ (1 - \phi_j)^{j-t} \left( a_j m c_j - w_j - \left( \frac{1}{1 - \phi_j} \int_{-\infty}^{v_{t,j}} \varepsilon_j g(\varepsilon_j) d\varepsilon_j \right) \right) - \phi_j f_j (1 - \phi_j)^{j-t-1} \right] \right\} \]

\[ f_t = a_t m c_t - w_t - \nu_{f,t} + \]
\[ + E_t \left\{ \sum_{j=t+1}^{\infty} \Delta_{t,j} \left[ (1 - \phi_j)^{j-t} \left( a_j m c_j - w_j - \left( \frac{1}{1 - \phi_j} \int_{-\infty}^{v_{t,j}} \varepsilon_j g(\varepsilon_j) d\varepsilon_j \right) \right) - \phi_j f_j (1 - \phi_j)^{j-t-1} \right] \right\} \]

IMPORTANT Retention rate > hiring rate

Cumulative Density Function
\[ \Gamma(\varepsilon_t) \]

Firing Rate: \( \phi \)

Hiring Rate: \( \eta \)
The Labor Market: Wage Determination

Bargaining:

\[ \Lambda = (w_t - b_t) \gamma (a_t^I p_z - w_t - \varepsilon^I)^{1-\gamma} \gamma \]

\[ w_t = \gamma (a_t m c_t - \varepsilon_t^I) + (1 - \gamma) b_t \]

Employment dynamics curve:

\[ n_t = (1 - \eta_t - \phi_t) n_{t-1} + \eta_t \]
Wholesale and Retail Sector

CES production technology:

\[ y_t = \left( \int_{y_{i,t}}^{x-1} \frac{y_{i,t}}{\epsilon} \, dy \right)^{\frac{\epsilon}{\epsilon-1}} \]

Rotemberg adjustment costs:

\[ \hat{\Pi}_{W,t} = E_t \sum_{i=t}^{\infty} \beta^{i-t} \Delta_t \left[ \frac{P_{i,t}}{P_t} y_{i,t} - p_{z,t} y_{i,t} - \frac{\psi}{2} \left( \frac{P_{i,t}}{P_{t,t-1}} - \bar{\pi} \right)^2 Y_t \right] \]

s.t. \[ y_{i,t} = y_t \left( \frac{P_{i,t}}{P_t} \right)^{-\epsilon} \]

Result:

\[ 0 = (1 - \epsilon) \beta^{-\sigma}_c + \epsilon \beta^{-\sigma}_c m c_t - \beta^{-\sigma}_c \Psi (\pi_t - \bar{\pi}) \pi_t \]

\[ + \beta E_t \{ c_{t+1}^{-\sigma} \Psi (\pi_{t+1} - \bar{\pi}) \frac{y_{t+1}}{y_t} \pi_{t+1} \}. \]
1. We look for an optimal commitment solution (unconstrained Ramsey)

2. We optimize the simple operational rule:

\[
\ln \left( \frac{1 + r^n_t}{1 + r^n} \right) = (1 - \phi_r) \left( \phi_\pi \ln \left( \frac{\pi_t}{\pi} \right) + \phi_y \ln \left( \frac{y_t}{y} \right) + \phi_n \ln \left( \frac{n_t}{n} \right) \right)
+ \phi_r \ln \left( \frac{1 + r^n_{t-1}}{1 + r^n} \right)
\]
Calibration

Table 1: Parameters of the Numerical Model

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Value</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\beta$</td>
<td>Subjective discount factor</td>
<td>0.99</td>
<td>Standard value</td>
</tr>
<tr>
<td>$\sigma$</td>
<td>Consumption utility</td>
<td>2</td>
<td>Log-utility</td>
</tr>
<tr>
<td>$\varepsilon$</td>
<td>Elasticity of subst.</td>
<td>10</td>
<td>Gali 2003</td>
</tr>
<tr>
<td>$\Psi$</td>
<td>Price adjustment cost</td>
<td>104.85</td>
<td>Equivalent to $\theta = 0.75$</td>
</tr>
<tr>
<td>$a$</td>
<td>Productivity</td>
<td>1</td>
<td>Normalization</td>
</tr>
<tr>
<td>$\gamma$</td>
<td>Workers’ bargaining power</td>
<td>0.5</td>
<td>Standard value</td>
</tr>
<tr>
<td>$f$</td>
<td>Firing cost</td>
<td>0.6</td>
<td>Bentolila and Bertola 1990</td>
</tr>
<tr>
<td>$h$</td>
<td>Hiring cost</td>
<td>0.1</td>
<td>Chen and Funke 2003</td>
</tr>
<tr>
<td>$b$</td>
<td>Unemployment benefits</td>
<td>0.5</td>
<td>OECD 2007</td>
</tr>
<tr>
<td>$E(\varepsilon)$</td>
<td>Expected value of op. costs</td>
<td>0.23</td>
<td>To match the flow rates</td>
</tr>
<tr>
<td>$sd$</td>
<td>Distr. scaling parameter</td>
<td>0.53</td>
<td>To match the flow rates</td>
</tr>
</tbody>
</table>
Model Reaction to Productivity Shocks under Different Levels of Firing Costs

<table>
<thead>
<tr>
<th>Volatilities</th>
<th>FC=0.4</th>
<th>FC=0.6</th>
<th>FC=0.8</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \pi )</td>
<td>0.62</td>
<td>0.62</td>
<td>0.55</td>
</tr>
<tr>
<td>( Y )</td>
<td>2.05</td>
<td>2.02</td>
<td>1.73</td>
</tr>
</tbody>
</table>

HP Filtered Volatilities
Ramsey Optimal Monetary Policy in the New Framework

• Monetary authority maximizes the discounted sum of utilities given the constraints of the competitive economy.
• Commitment solution
• Timeless perspective approach (the value of the co-state variables is set to their solution in the steady state).
Optimal Reaction to a Productivity Shock

Autocorrelation of the shock: 0.95
Intuition

• The New Keynesian Phillips Curve with labor turnover costs:

\[ \hat{\pi}_t = \beta E_t \hat{\pi}_{t+1} + \frac{\varepsilon W}{A} \hat{\omega}_t + \frac{\varepsilon^{\psi}}{A} \hat{v}_{h,t} - \beta \frac{\varepsilon^{\psi}}{A} E_t \hat{\Pi}_{I,t+1} - \frac{\varepsilon (\varepsilon - 1)}{\Psi} \hat{a}_t \]

• The hiring threshold and the expected future profits of a worker act as an endogenous (microfounded) cost-push shock.
• Therefore, an endogenous tradeoff between inflation and unemployment stabilization arises.
• Thus, it is no longer optimal to only counteract the price distortion!
Optimal Inflation Volatility
Optimal Reaction to a Government Spending Shock

Autocorrelation of the shock: 0.9
Optimal Operational Rules: Response to a Productivity Shock 1

• Which coefficients deliver the highest level of welfare?

\[
\ln\left(\frac{1 + r^n_t}{1 + r^n}\right) = (1 - \phi_r)\left(\phi_\pi \ln\left(\frac{\pi_t}{\pi}\right) + \phi_y \ln\left(\frac{y_t}{y}\right) + \phi_n \ln\left(\frac{n_t}{n}\right)\right) \\
+ \phi_r \ln\left(\frac{1 + r^n_t}{1 + r^n}\right)
\]

\[
\phi_r = 0.00765794, \phi_\pi = 1.66628, \phi_y = -0.117797, \phi_n = -0.055
\]

Procyclicality
Optimal Operational Rules: Response to a Productivity Shock 2
Conclusion

• Labor markets do matter a lot for monetary policy!
• In a model with heterogeneous productivity and labor turnover costs, monetary policy faces a severe short-run tradeoff between the stabilization of output and inflation.
• In this framework, it is optimal to deviate from a pure price stability policy.
• Central banks in countries with larger labor turnover costs should allow for bigger deviations from price stability.
Appendix

\[ a_t mc_t - w_t - v_{h,t} + E_t(\beta \frac{c_{t+1}}{c_t} \tilde{\Pi}_{I,t+1}(v_{h,t+1}, v_{f,t+1})) = h_t \]

\[ a_t mc_t - w_t - v_{f,t} + E_t(\Delta_{t+1} \tilde{\Pi}_{I,t+1}(v_{h,t+1}, v_{f,t+1})) = -f_t \]

\[ n_t = n_{t-1}(1 - \phi_t - \eta_t) + \eta_t \]

\[ w_t = \gamma (a_t mc_t - \varepsilon_t^I) + (1 - \gamma) b_t \]

\[ 0 = (1 - \varepsilon) + \varepsilon (mc_t) - \Psi (\pi_t - \bar{\pi}) \pi_t + \beta E_t \left\{ \frac{c_{t+1}}{c_t} \Psi (\pi_{t+1} - \bar{\pi}) \frac{y_{t+1}}{y_t} \pi_{t+1} \right\} \]

\[ c_t = y_t - n_t \phi_f t - (1 - n_t)\eta_t h_t - (1 - \phi)n_t a_t \xi_t^i - \]

\[ (1 - n_t)\eta_t \xi_t^e - \frac{\Psi}{2} (\pi_t - \bar{\pi})^2 y_t \]