Monetary Policy, Labor Market Tail Risks and Asset Prices

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Motivation

- Monetary policy has a significant impact on stock market valuation
  - Evidence suggests large part of the impact is due to risk premium
- In Rep agent models, risk premium changes either due to changes in risk aversion or volatility
  - Still an open question...No compelling evidence for either
- This paper:
  - **Risk sharing channel of monetary policy**
  - Expansionary monetary policy improves risk sharing conditions and lowers risk premium

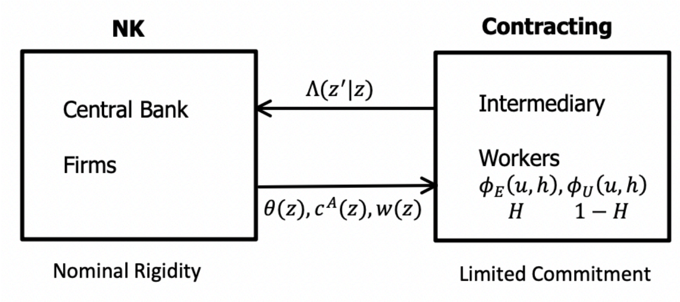
Risk sharing channel of monetary policy

- Theory builds on Ai&Bhandari (2021):
  - Principal side limited commitment tighter in bad times
  - Less risk sharing in bad times $\Rightarrow$ higher risk premium
  - Optimal contracting approach to asset pricing
- Empirical evidence:
  - Strong link between discount rate variations and labor market outcomes in the data: Meeuwis et al (2025)
- This paper:
  - Expansionary monetary policy alleviates principal-side limited commitment constraint
  - Improve risk sharing and lowers risk premium
  - A GE model with nominal rigidity and optimal contracting

Main Intuition

- Principal-side limited commitment:
$$p(u) \geq 0$$
- Under this constraint, workers payment is font loaded and intermediary payment is backloaded
- Why? Principal wants to do it by provide more c and less u, because less u makes the constraint less binding
- Principal cash flow back loaded $\Rightarrow$ **Lower interest rate raises valuation and make the constraint less binding!**

Big picture of the model



NK

1. Competitive final good producer
   - Demand for variety i:
   $$Y_{i,t} = \left(\frac{P_{i,t}}{P_t}\right)^{-\eta} Y_t$$
2. Monopolistic competitive variety i producer
   - Using intermediate output to produce variety
   $$Y_{it} = \tilde{Y}_{it}$$
   - Nominal Rigidity (Rotemberg, 1982)
   $$\max_{\{P_{i,t}\}_{t=0}^{\infty}} E \sum_{t=0}^{\infty} \Lambda_t \left\{ \left(\frac{P_{i,t}}{P_t} - \omega_t\right) \left(\frac{P_{i,t}}{P_t}\right)^{-\eta} Y_t - \frac{\phi}{2} \left(\frac{P_{i,t}}{P_{i,t-1}} - 1\right)^2 Y_t \right\}$$
3. **Intermediate output producer (Focus)**
   - Take $\omega(z)$ as given, make investment/labor hiring/separation decisions

NK

Intermediate output producer

$$
\begin{aligned}
v(k,H,z) = \max_{i,a,u,\theta} \Big\{ & \omega(z)(uk)^{\alpha}(\theta H + a)^{1-\alpha} - w(z)[\theta H + (1+\lambda)a] \\
& - b(\theta)H - i - \frac{\Omega}{2}\left(\frac{i}{k} - i^*\right)^2 k + E\left[\Lambda\left(z,z'\right) e^{g'} v\left(k',H',z'\right)\right] \\
& H' = \theta H + a \\
& k' = e^{-g'}\left[(1-\delta(u))k + i\right]
\end{aligned}
$$

- Normalization: $k = \frac{K}{Z}$, $w = \frac{W}{Z}$, $i = \frac{I}{Z}$, $v = \frac{V}{Z}$
- Firms retain θH and hire externally a to work, which incurs retention cost $b(\theta)H$ and training cost λwa

$$\lambda w(z) = b'(\theta(z))$$

- Firms choose utilization level u. A higher u increases the depreciation rate $\delta(u)$
- Firms invest i, which incurs capital adjustment cost $\frac{\Omega}{2}\left(\frac{i}{k} - i^*\right)^2$

Labor market dynamics

Employed, Unemployed, Application Pool

- Aggregate human capital is one
- At the beginning of the period, $\mathbf{H}$ and $(\mathbf{1}-\mathbf{H})$ are human capital in employment and unemployment pool respectively
- Firms retain $\theta\mathbf{H}$ and hire externally $\mathbf{a}$ to work
- Fraction χ of the unemployed worker flows to the application pool
- Application pool clears: $\mathbf{a}=\chi(\mathbf{1}-\mathbf{H}) \rightarrow$ pins down wage

Idiosyncratic human capital shocks

- When employed, no idiosyncratic shocks
- When unemployed, workers receive idiosyncratic permanent human capital shocks every period

$$h' = he^{-\zeta} \quad \text{with} \quad E\left(e^{-\zeta}\right) = 1$$

NK

Central bank

- Central Bank follows Tylor rule:

$$-\ln E\left[\left(\Lambda\left(z, z'\right) e^{-\pi(z')} \mid z\right] = r^* + \phi\pi(z) - e$$

Intermediary

- Provide insurance contracts to all employed and unemployed workers subject to limited-commitment constraint

Preference

- Intermediary and all workers have recursive utility. The SDF follow

$$\Lambda\left(g', e' \mid z\right) = \beta\left[\frac{x\left(z'\right) c^A\left(z'\right) e^{g'}}{x(z) c^A(z)}\right]^{-\frac{1}{\psi}}\left[\frac{v\left(z'\right) e^{g'}}{n(z)}\right]^{\frac{1}{\psi}-\gamma}$$

Exogenous shocks

- 1. TFP: $\ln Z_{t+1} - \ln Z_t = g_t \in \{g_H, g_L\}$ 2. MPS: $e_t \in \{e_H, e_L\}$

Contracting

Employed worker

$$
\begin{aligned}
p(1, u \mid z) = \max_{c, \{u'(g', e', \iota', \zeta')\}} & [w(z) - c] \\
& + E[\Lambda \left(g', e' \mid z\right) e^{g'} \left\{\theta\left(z'\right) p\left(1, u'\left(g', e', 1, 0\right) \mid z'\right)\right. \\
& \left. + \left(1 - \theta\left(z'\right)\right) \int e^{-\zeta} p\left(0, u'\left(g', e', 0, \zeta'\right) \mid z'\right) f\left(\zeta'\right) d\zeta' \right\}
\end{aligned}
$$

Unemployed worker

$$
\begin{aligned}
p(0, u \mid z) = \max_{c, \{u'(g', e', \iota', \zeta')\}} & -c \\
& + E[\Lambda \left(g', e' \mid z\right) e^{g'} \left\{\chi p\left(1, u'\left(g', e', 1, 0\right) \mid z'\right)\right. \\
& \left. + (1 - \chi) \int e^{-\zeta} p\left(0, u'\left(g', e', 0, \zeta'\right) \mid z'\right) f\left(\zeta'\right) d\zeta' \right\}
\end{aligned}
$$

Normalization: $p = \frac{P}{Zh}, c = \frac{C}{Zh}, u = \frac{U}{Zh}$

Contracting

Constraints

- Limited commitment:

$$p\,(\iota, u \mid z) \geq 0, \quad \forall \iota, u, z$$

- Promise keeping:

$$u\,(\iota, z) = \left[(1-\beta)c^{1-\frac{1}{\psi}} + \beta m\,(\iota, z)^{1-\frac{1}{\psi}}\right]^{\frac{1}{1-1/\psi}}$$

where

$$m(1, z) = E\Big\{e^{(1-\gamma)g'}\big[\theta(z')\,u'(g', e', 1, 0)^{1-\gamma} + \big(1-\theta(z')\big)\int e^{-(1-\gamma)\zeta'}u'(g', e', 0, \zeta')^{1-\gamma} f(\zeta')\,d\zeta'\big]\Big\}$$

Replace $\theta\,(z')$ with χ for $m(0, z)$

Distributions $\phi_E(u,h)$, $\phi_U(u,h)$

- Define
$$\phi_E(u) = \int h\phi_E(u,h)dh, \quad \phi_U(u) = \int h\phi_U(u,h)dh$$
- LOM:
$$\phi_E'\left(u'\right) = \theta\left(z'\right)\int I_{\{u'(u,1|g',e',1)=u'\}}\phi_E(u)du + \chi\int I_{\{u'(u,0|g',e',1)=u'\}}\phi_U(u)du$$
$$\begin{aligned}\phi_U'\left(u'\right) = {} & \left[1-\theta\left(z'\right)\right]\iint e^{-\zeta'} f\left(\zeta'\right) I_{\{u'(u,1|g',e',\zeta')=u'\}}d\zeta'\phi_E(u)du \\ & + (1-\chi)\iint e^{\zeta'} f\left(\zeta'\right) I_{\{u'(u,0|g',e',\zeta')=u'\}}d\zeta'\phi_U(u)du\end{aligned}$$
- Construct principal's share of consumption x_t:
$$\int c\left(u,1;z_t,x_t\right)\phi_{E,t}(u)du + \int c\left(u,0;z_t,x_t\right)\phi_{U,t}(u)du = \left(1-x_t\right)c^A\left(z_t,x_t\right)$$
- Update perceived law of motion of x_t:
$$\begin{aligned}\ln x' &= \Phi\left(g',e',g,e,k,H,\ln x\right) \\ &\approx a\left(g',e',g,e\right) + b\left(g',e',g,e\right)\ln x\end{aligned}$$

Impulse responses

Solved in a complete market.

Expansionary monetary policy shock

- $\pi\uparrow$, $\omega\uparrow$, $u\uparrow$, $\frac{i}{k}\uparrow$, $w\uparrow$, $\theta\uparrow$, $c^A\uparrow$, $r\downarrow$, $\pi+r\downarrow$

High growth shock

- $\pi\uparrow$, $\omega\uparrow$, $u\uparrow$, $\frac{i}{k}\uparrow$, $w\uparrow$, $\theta\uparrow$, $c^A\downarrow$, $r\uparrow$, $\pi+r\uparrow$

Progress and Plans

Have done

- Solved NK block with representative agent
    - $x(z) = 1$ for all z

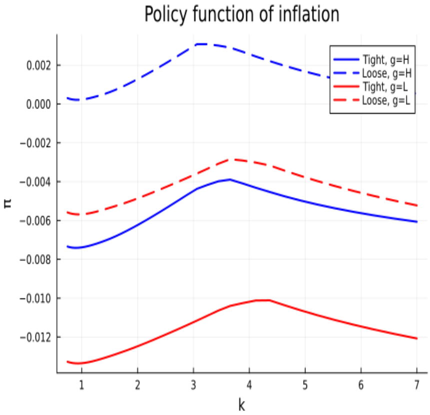
Plans

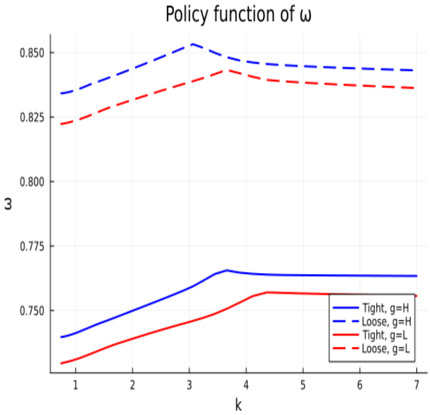
- Solve contracting block insulated from NK block
    - $\theta(z) = \theta(g, e)$, $c^A(z) = c^A(g, e)$, $w(z) = w(g, e)$
- Solve the full GE and find the functional form of Φ that makes algorithm stable and is a good approximation

Happy Thanksgiving next week!

Appendix: policy functions

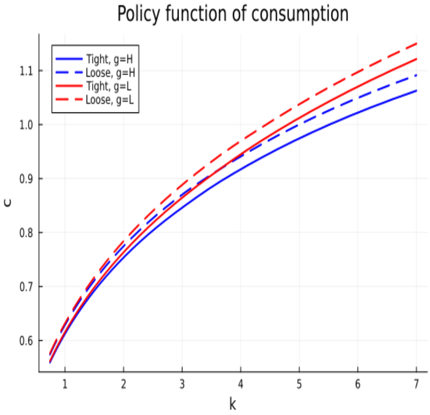
Inflation/Intermediate good price

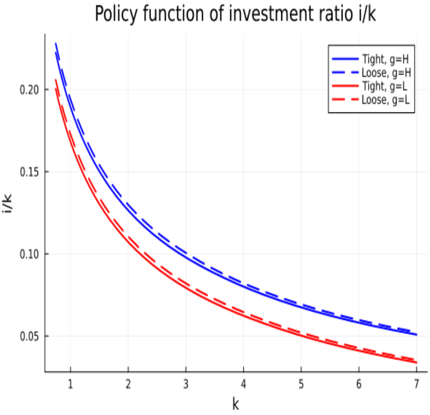




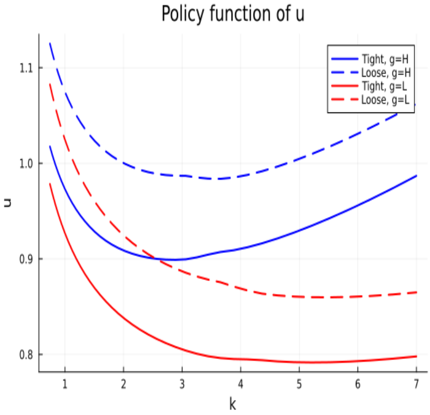
- All plots are evaluated at stochastic steady state level of h

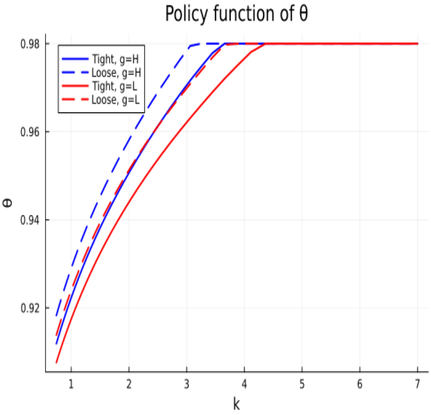
Consumption/Investment



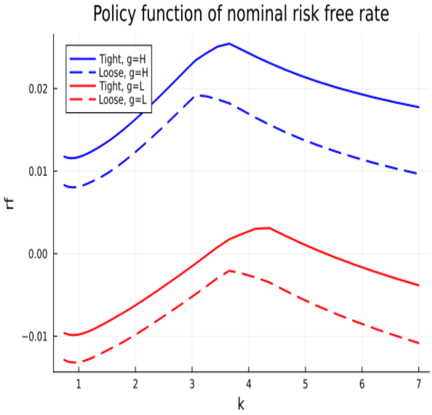


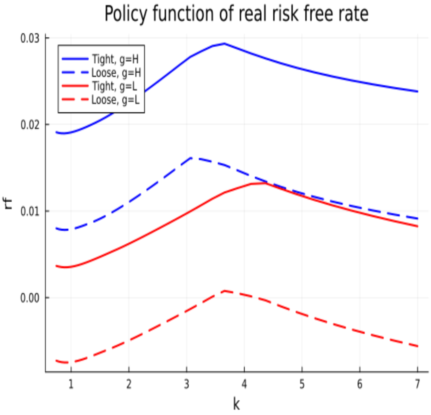
Capital utilization/Labor retention rate





Nominal rate/ Real rate





Wage


Policy function of wage
Tight, g=H
Loose, g=H
Tight, g=L
Loose, g=L
w
k
1.1
1.0
0.9
0.8
0.7
0.6
0.5
1
2
3
4
5
6
7