

"A New Keynesian Model with Unemployment" by Olivier Blanchard and Jordi Gali

Discussion by Kai Christoffel

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The opinions expressed do not necessarily reflect the views of the ECB.

- Integration of Diamond-Mortensen-Pissarides framework in New Keynesian Model
- Focus on analytical results and monetary policy implications
- Contribution of this paper: the tractable and analytically solvable model allows to disentangle the impact of the different inefficiencies and rigidities and relate these to monetary policy
- Important variant to most other models of this type relying on numerical results.

Monopolistic Competition Sticky Price Model with Labor Market Block

- Setup of monopolistic competition
- Sticky prices a la Calvo
- Simplified Mortensen Pissarides (MP) framework for labor market
- Real wage rigidity

Model: Labor Market and Preferences

Exogenous separation of existing work relation. Firms have to pay hiring costs to replace the workers.

- Employment in firm i

$$N_t(i) = (1 - \delta)N_{t-1}(i) + H_t(i)$$

- Hiring costs per hire increases in market tightness

$$G_t = A_t B \left(\frac{H_t}{U_t} \right)^\alpha = A_t B X_t^\alpha$$

- **Period employment becomes choice variable !**
- logarithmic utility function and linear production \Rightarrow income effect = substitution effect on labor supply

Social Planner: Constraint Efficient Allocation

Flexible prices: social planner maximizes welfare under budget restriction

$$C_t = A_t(N_t - Bx_t^\alpha H_t)$$

$$\underbrace{\frac{\chi C_t N_t^\phi}{A_t}}_{MRS} \leq \underbrace{1 - (1 + \alpha) B x_t^\alpha}_{\text{marginal net output}} + \underbrace{\beta(1 - \delta) E_t \left(\frac{C_t}{C_{t+1}} \frac{A_{t+1}}{A_t} B (x_{t+1}^\alpha + \alpha x_{t+1}^\alpha (1 - x_{t+1})) \right)}_{\text{savings in hiring costs}}$$

- Plug in budget constraint $\Rightarrow A_t$ drops out of optimality condition iff utility function is logarithmic \Rightarrow labor market tightness and employment invariant to technology level
- This allocation can also be implemented in a decentralized way under the Hosios (1990) condition and under the assumption that the mark-up is equal to one

Social Planner (flexible prices): Constraint Efficient Allocation II

Alternative preferences:

$$U(C_t) = \frac{C_t^{1-\sigma}}{1-\sigma}, Y_t = A_t N_t^\psi \text{ and } C_t = A_t(N_t^\psi - Bx_t^\alpha H_t)$$

$$\underbrace{\frac{\chi C_t^\sigma N_t^\phi}{A_t}}_{MRS} \leq \underbrace{\psi N_t^{\psi-1} - (1+\alpha) B x_t^\alpha}_{\text{marginal net output}} + \underbrace{\beta(1-\delta) E_t \left(\left(\frac{C_t}{C_{t+1}} \right)^\sigma \frac{A_{t+1}}{A_t} B (x_{t+1}^\alpha + \alpha x_{t+1}^\alpha (1-x_{t+1})) \right)}_{\text{savings in hiring costs}}$$

Decentralized equilibrium condition under rigid real wages:

Assuming $W_t = \Theta A_t^{1-\gamma}$. This breaks the relation between income and substitution effect after technology shock

$$\Theta A_t^{-\gamma} = \frac{1}{M} - Bx_t^\alpha + \beta(1 - \delta) E_t \left(\frac{C_t}{C_{t+1}} \frac{A_{t+1}}{A_t} Bx_{t+1}^\alpha \right)$$

\Rightarrow labor fluctuates after technology shock \Rightarrow inefficiency due to increased hiring activity.

Optimal Monetary Policy under the 4 rigidities

Introduction of sticky prices into the model: Various inefficiencies

- 1 Mark-up and bargaining share \Rightarrow suboptimal employment level but invariant to monetary policy
- 2 Monopolistic competition and sticky prices \Rightarrow price Dispersion \Rightarrow inflation targeting
- 3 Labor market matching and real wage rigidities \Rightarrow monetary policy should aim to (partially) stabilize unemployment. Trade-off between unemployment and inflation stabilization
- 4 Under alternative preferences the combination of sticky prices in monopolistic competitive environment and the labor market block implies the trade-off between unemployment and inflation stabilization.

- Intuitive and very instructive analysis on the role of the four inefficiencies in the model
- Under the chosen specification wage rigidities are the decisive friction for monetary policy \Rightarrow inflation and unemployment targeting
- This result is sensitive to the assumptions
 - Preferences are logarithmic
 - Technology shock is only stochastic element
 - Employment is choice variable of firm. MP: level of vacancy posting is choice variable \Rightarrow impact on future employment

Two New Keynesian Models with Unemployment and Wage Rigidities

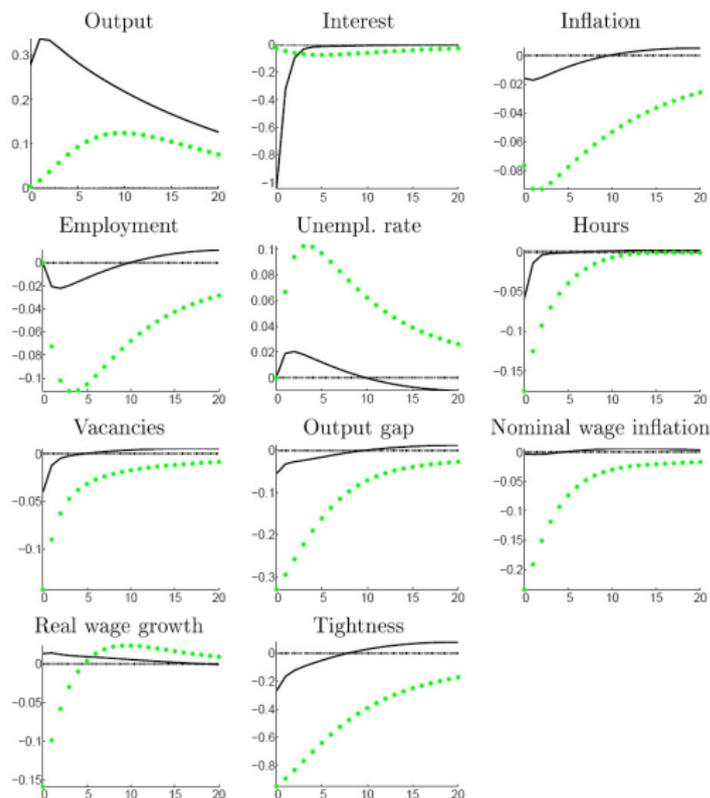
Blanchard and Gali

- Calibrated model
- Log utility and linear production
- Technology shock only
- Hiring costs, employment as choice variable
- Extensive employment margin only
- Analytical results

Christoffel, Kuester, Linzert

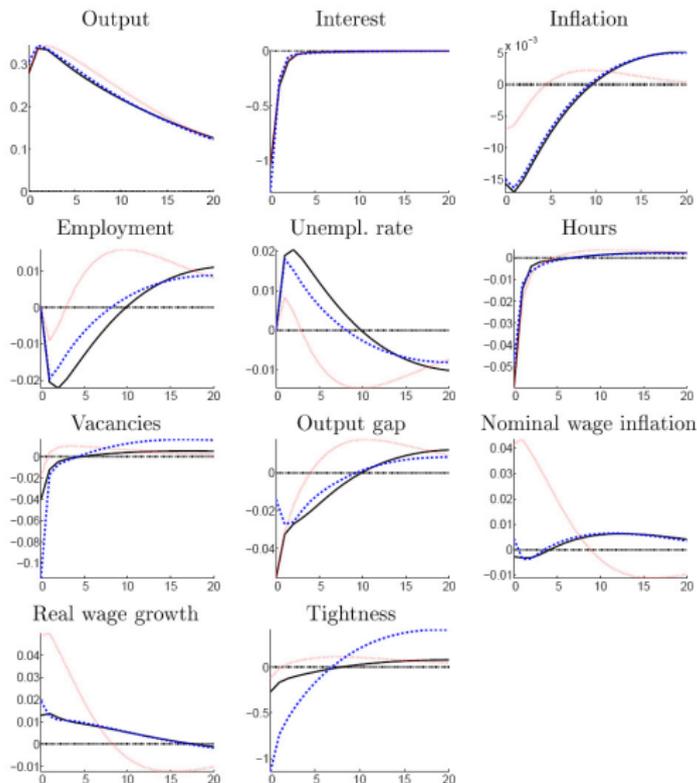
- Estimated model
- CES preferences and C-D production
- 6 structural shocks
- Vacancy posting as choice variable
- Intensive and extensive margin
- Numerical results from Ramsey approach

Technology Shock: Estimated Rule vs. Optimal Rule



- 1 Solid black line: IRFs under Optimal Ramsey Policy
- 2 Green dotted line IRFs under estimated rule

Technology Shock: Optimal Rules under different labor market settings



- 1 Solid black line: IRFs under Optimal Ramsey Policy
- 2 Dashed blue line: IRFs under more flexible labor market
- 3 Red dotted line: IRFs under reduced wage rigidity

Welfare Ranking:
 $2 > 1 > 3$

- Analytical results in Blanchard and Gali
 - Central bank should target inflation and unemployment
 - Wage rigidity is the decisive rigidity for the monetary policy
- Simulation based results in CKL:
 - Central Bank should target inflation and outputgap/unemployment/nominal wage growth
 - The degree of wage rigidity has a strong effect on monetary policy
 - The degree of labor market rigidities has a minor impact on optimal policy