Coordinating Monetary and Financial Regulatory Policies

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The views expressed on this discussion are my own and do not necessarily reflect those of the European Central Bank.
Introduction

- **What I do**

  Study coordination between monetary and macro-prudential policies
  
  Emphasis → coordination throughout the economic cycle

- **How I do it**

  **Model:** New Keynesian economy + Balance-sheet-driven fluctuations
  
  **Policy exercise:** Contrast between traditional and coordinated mandates

- **Main results**

  | Trad. MoPo | mimicking natural rate of return |
  | MacroPru | replicating constrained policy of flexible price econ. |
  | Coor. MoPo | deviating from natural rate of return: Greenspan put + LAW |
  | MacroPru | softening relative to traditional mandate |

SW 0.07% annual consumption equivalent
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  MacroPru: replicate constrained policy of flexible price econ.
  Coor. MoPo: deviate from natural rate of return: Greenspan put + LAW
  MacroPru: soften relative to traditional mandate
  SW: Coordinated Traditional by 0.07%
  annual consumption equivalent
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Model economy → building blocks

I. Sluggish nominal price adjustments of firms
→ Calvo (1983)

II. Financial intermediaries good at providing financing to firms, but subject to incentive-compatible leverage constraints
Roadmap

- Model economy → building blocks
  1. Sluggish nominal price adjustments of firms
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  2. Financial intermediaries good at providing financing to firms, but subject to incentive-compatible leverage constraints

- Model economy → main features of the competitive equilibrium
  1. Identify the sources of inefficiency
  2. Define the mandates for policy
Roadmap

- Model economy → building blocks
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- Model economy → main features of the competitive equilibrium
  - I. Identify the sources of inefficiency
  - II. Define the mandates for policy

- Policy exercise → contrast btw traditional and coordinated mandates
  - I. Derive the optimal policy under each mandate
  - II. Quantitatively assess the costs and benefits from the coordinated mandate relative to the traditional mandate
Firms produce intermediate goods out of labor and capital services

\[ y_{j,t} = A_t l_{j,t}^{\alpha} k_{j,t}^{\alpha} \quad \text{with } j \in [0, 1] \]

\[ A_t \rightarrow \text{evolves locally stochastically, } dA_t / A_t = \mu_A dt + \sigma_A dZ_t \]
Model Economy
Building Block I

- Firms produce intermediate goods out of labor and capital services

\[ y_{j,t} = A_t l_{j,t}^\alpha k_{j,t}^\alpha \] with \( j \in [0, 1] \)

- \( A_t \) evolves locally stochastically, \( dA_t / A_t = \mu_A dt + \sigma_A dZ_t \)

- CES aggregator transforms intermediate goods into final cons. good

\[ y_t = \left[ \int_0^1 y_{j,t}^{\varepsilon-1} \, dj \right]^{\frac{\varepsilon}{\varepsilon-1}} \] with \( \varepsilon > 1 \)
Firms produce intermediate goods out of labor and capital services

\[ y_{j,t} = A_t l_{j,t}^{\alpha} k_{j,t}^{\alpha} \quad \text{with } j \in [0, 1] \]

\( A_t \) evolves locally stochastically,

\[ \frac{dA_t}{A_t} = \mu_A dt + \sigma_A dZ_t \]

CES aggregator transforms intermediate goods into final cons. good

\[ y_t = \left[ \int_0^1 y_{j,t}^{\frac{\varepsilon-1}{\varepsilon}} dj \right]^{\frac{\varepsilon}{\varepsilon-1}} \quad \text{with } \varepsilon > 1 \]

Firms reset nominal price \( p_{j,t} \) sluggishly according to Calvo (1983)

agg. price level \( p_t \) evolves locally deterministically,

\[ \frac{dp_t}{p_t} = \pi_t dt + 0 dZ_t \]
Fin. intermediaries and households provide capital services to firms,

\[ k_t = a_k, \text{ with } a_f > a_h \rightarrow \text{fin. intermediaries better than households} \]
Fin. intermediaries and households provide capital services to firms, 
\[ k_t = a \bar{k}_t, \text{ with } a_f > a_h \rightarrow \text{fin. intermediaries better than households} \]

Fin. intermediaries maximize PDV of their dividend payouts

\[
V_t \equiv \max_{\bar{k}_f,t,b_t} E_t \int_t^\infty \gamma e^{\gamma (s-t)} \frac{\Lambda_s}{\Lambda_t} n_{f,s} ds ,
\]

subject to...
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BC
\[ q_t \bar{k}_{f,t} = b_t + n_{f,t} \]
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subject to...

**BC**

\( q_t \bar{k}_f,t = b_t + n_{f,t} \)

**FC1**

\( q_t \bar{k}_f,t \leq \lambda V_t \quad \Rightarrow \quad q_t \bar{k}_f,t \leq \lambda v_t n_{f,t} \)
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\[ q_t \bar{k}_{f,t} = b_t + n_{f,t} \]

**FC1**

\[ q_t \bar{k}_{f,t} \leq \lambda V_t \implies q_t \bar{k}_{f,t} \leq \lambda v_t n_{f,t} \]

**FC2**

\[ q_t \bar{k}_{f,t} \leq \Phi_t n_{f,t} \]
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\[ V_t \equiv \max_{k_f,t, b_t} E_t \int_t^\infty \gamma e^{\gamma(s-t)} \frac{\Lambda_s}{\Lambda_t} n_{f,s} ds, \]

subject to...

\begin{align*}
\text{BC} & \quad q_t \bar{k}_f,t = b_t + n_{f,t} \\
\text{FC1} & \quad q_t \bar{k}_f,t \leq \lambda V_t \quad \Rightarrow \quad q_t \bar{k}_f,t \leq \lambda v_t n_{f,t} \\
\text{FC2} & \quad q_t \bar{k}_f,t \leq \Phi_t n_{f,t} \\
\text{LoM} & \quad dn_{f,t} = [a_f r_{k,t} dt + dq_t] \bar{k}_f,t - (i_t - \pi_t) b_t dt
\end{align*}
Fin. intermediaries and households provide capital services to firms,

\[ k_t = a\bar{k}_t, \text{ with } a_f > a_h \rightarrow \text{fin. intermediaries better than households} \]

Fin. intermediaries maximize PDV of their dividend payouts

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V_t \equiv \max_{\bar{k}_{f,t}, b_t} E_t \int_t^\infty \gamma e^{\gamma(s-t)} \frac{\Lambda_s}{\Lambda_t} n_{f,s} \, ds ,
\]

subject to...

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\[ q_t \bar{k}_{f,t} = b_t + n_{f,t} \]

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**FC2**

\[ q_t \bar{k}_{f,t} \leq \Phi_t n_{f,t} \]

**LoM**

\[ dn_{f,t} = [a_f r_{k,t} \, dt + dq_t] \bar{k}_{f,t} - (i_t - \pi_t) b_t \, dt \]

- Households \( \rightarrow \) consume \( c_t \), supply labor \( l_t \), and invest in \( -b_t, \bar{k}_{h,t} \)
Competitive Equilibrium

Definition & Main Results

- Standard definition. Physical capital in fixed supply: $\bar{k}_{h,t} + \bar{k}_{f,t} = \bar{k}$
Competitive Equilibrium
Definition & Main Results

- Standard definition. Physical capital in fixed supply: $\bar{k}_{h,t} + \bar{k}_{f,t} = \bar{k}$

R1 Leverage constraint $q_t \bar{k}_{f,t} \leq \min \{\lambda v_t, \Phi_t\} n_{f,t}$ occasionally binds
binds $\iff \min \{\lambda v_t, \Phi_t\} n_{f,t} < q_t \bar{k}$
Competitive Equilibrium
Definition & Main Results

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R2 If \( \Phi_t = +\infty \), competitive equilibrium is constrained-inefficient

Pecuniary externalities: distributive, binding-constraint, and dynamic
Competitive Equilibrium
Definition & Main Results

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**R1**  Leverage constraint \( q_t \bar{k}_{f,t} \leq \min \{ \lambda v_t, \Phi_t \} n_{f,t} \) occasionally binds
binds \( \iff \min \{ \lambda v_t, \Phi_t \} n_{f,t} < q_t \bar{k} \)

**R2**  If \( \Phi_t = +\infty \), competitive equilibrium is constrained-inefficient
Pecuniary externalities: distributive, binding-constraint, and dynamic

**R3**  Aggregate production function \( \rightarrow y_t = \zeta_t A_t l_t^{\alpha} \bar{k}^{1-\alpha} \), with...
Competitive Equilibrium
Definition & Main Results

- Standard definition. Physical capital in fixed supply: \( \bar{k}_{h,t} + \bar{k}_{f,t} = \bar{k} \)

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Pecuniary externalities: distributive, binding-constraint, and dynamic

R3 Aggregate production function \( \rightarrow y_t = \zeta_t A_t l_t^\alpha \bar{k}^{1-\alpha} \), with...
\( \zeta_t \equiv a_t^{1-\alpha}/\omega_t \), \( a_t \bar{k} \equiv a_h \bar{k}_{h,t} + a_f \bar{k}_{f,t} \), and \( \omega_t y_t \equiv \int_0^1 y_{j,t} dj \)
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\[ \zeta_t \equiv a_t^{1-\alpha} / \omega_t, \quad a_t \bar{k} \equiv a_h \bar{k}_{h,t} + a_f \bar{k}_{f,t}, \quad \text{and} \quad \omega_t y_t \equiv \int_0^1 y_{j,t} dj \]

SW Preferences \( u(c, l) = \ln c - \chi \frac{1}{1+\psi} l^{1+\psi} \). Utility flows are:

\[ \ln \frac{1}{\omega_t} + \alpha \ln l_t - \chi \frac{1}{1+\psi} l_t^{1+\psi} + (1 - \alpha) \ln a_t + \ln A_t + (1 - \alpha) \ln \bar{k} \]
Competitive Equilibrium
Definition & Main Results

- Standard definition. Physical capital in fixed supply: \( \bar{k}_{h,t} + \bar{k}_{f,t} = \bar{k} \)

R1 Leverage constraint \( q_t \bar{k}_{f,t} \leq \min \{ \lambda v_t, \Phi_t \} n_{f,t} \) occasionally binds
  \( \Longleftrightarrow \min \{ \lambda v_t, \Phi_t \} n_{f,t} < q_t \bar{k} \)

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\]

First best \( \to \omega_t = 1, \ l_t = l_* \equiv (\alpha/\chi)^{1+\psi}, \ \bar{k}_{f,t} = 1 \)
Policy Exercise
Traditional Mandate

- Separate objectives and no cooperation $\rightarrow$ Nash equilibrium

$\text{MoPo} \rightarrow \max_{i_t} \left\{ PDV \ of \ \ln \left( \frac{1}{\omega_t} + \alpha \ln l_t - \chi \frac{1}{1+\psi} l_t^{1+\psi} \right) \right\}$

$\text{MacroPru} \rightarrow \max_{\Phi_t} \left\{ PDV \ of \ (1 - \alpha) \ln a_t \right\}$
Policy Exercise

Traditional Mandate

- Separate objectives and no cooperation → Nash equilibrium
  
  \[
  \text{MoPo} \rightarrow \max_{i_t} \left\{ \text{PDV of } \ln \frac{1}{\omega_t} + \alpha \ln l_t - \chi \frac{1}{1+\psi} l_t^{1+\psi} \right\}
  \]

  \[
  \text{MacroPru} \rightarrow \max_{\Phi_t} \left\{ \text{PDV of } (1 - \alpha) \ln a_t \right\}
  \]

  \text{NE } \text{MoPo} \rightarrow \text{mimic natural rate of return}

  \Rightarrow \pi_t = 0, \ \omega_t = 1, \ l_t = l_*
Separate objectives and no cooperation → Nash equilibrium

\[ \text{MoPo} \rightarrow \max_{i_t} \left\{ PDV \ of \ \ln \frac{1}{\omega_t} + \alpha \ln l_t - \chi \frac{1}{1+\psi} l_t^{1+\psi} \right\} \]

\[ \text{MacroPru} \rightarrow \max_{\Phi_t} \left\{ PDV \ of \ (1-\alpha) \ln a_t \right\} \]

**NE** \[ \text{MoPo} \rightarrow \text{mimic natural rate of return} \]
\[ \pi_t = 0, \ \omega_t = 1, \ l_t = l^*_t \]

\[ \text{MacroPru} \rightarrow \text{replicate constrained efficient } \Phi_t \text{ of flex. price econ.} \]
Costs and Benefits from Macro-prudential Policy

Flexible Price Economy

↓ distributive externality, ↑ binding-constraint externality

Van der Ghote (European Central Bank)  Monetary and Financial Regulatory Policies
Policy Exercise (cont.)

Coordinated Mandate

- Obj. $\rightarrow \max_{i_t, \Phi_t} \left\{ PDV \ of \ \ln \frac{1}{\omega_t} + \alpha \ln l_t - \chi \frac{1}{1+\psi} l_t^{1+\psi} + (1 - \alpha) \ln a_t \right\}$
Policy Exercise (cont.)

Coordinated Mandate

- **Obj.** \( \rightarrow \max_{i_t, \Phi_t} \left\{ \text{PDV of } \ln \frac{1}{\omega_t} + \alpha \ln l_t - \chi \frac{1}{1+\psi} l_t^{1+\psi} + (1 - \alpha) \ln a_t \right\} \)

- **Optimal policy**

---

![Graphs](https://via.placeholder.com/150)

**Employment Gap**

- **Traditional Mandate**
- **Coordinated Mandate**

**Leverage Multiple**

- **Traditional Mandate**
- **Coordinated Mandate**

Intermediary Wealth Share, \( n_{f,t}/q_t \bar{k} \)
Policy Exercise (cont.)

Coordinated Mandate

- Obj. → max_{i_t, \Phi_t} \left\{ \text{PDV of } \ln \frac{1}{\omega_t} + \alpha \ln l_t - \chi \frac{1}{1+\psi} l_t^{1+\psi} + (1 - \alpha) \ln a_t \right\}

- Optimal policy

\[
\int a_f \frac{r_{k,t}}{q_t} dt + \frac{dq_t}{q_t} - (i_t - \pi_t) dt, \text{ with } q_t \rightarrow \text{PDV of } r_{k,t}
\]
Baseline calibration

<table>
<thead>
<tr>
<th>Parameter Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>$ ah $</td>
</tr>
<tr>
<td>70%</td>
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Contrast between Traditional and Coordinated Mandates
Quantitative Analysis

- Baseline calibration

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- Social welfare gains in annual consumption equivalent

<table>
<thead>
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<th>Coordinated Mandate over Traditional Mandate</th>
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<tbody>
<tr>
<td>Present Discounted Value of $\ln \frac{1}{\omega}$</td>
</tr>
<tr>
<td>Baseline calibration</td>
</tr>
<tr>
<td>... but with $a_h = 60%$</td>
</tr>
<tr>
<td>... but with $\theta = \ln 2^{4/5}$</td>
</tr>
<tr>
<td>... but with $\varepsilon = 4$</td>
</tr>
</tbody>
</table>
Conclusion

**Traditional Mandate**
MoPo $\rightarrow$ mimic natural rate of return
MacroPru $\rightarrow$ replicate constrained eff. policy of flexible price econ.

**Coordinated Mandate**
MoPo $\rightarrow$ deviate from natural rate of return: Greenspan put $+$ LAW
MacroPru $\rightarrow$ soften relative to traditional mandate

**Social Welfare Gains**
*Coordinated* $\succ$ *Traditional* by 0.07% annual consumption equivalent