Monetary Policy in a Channel System

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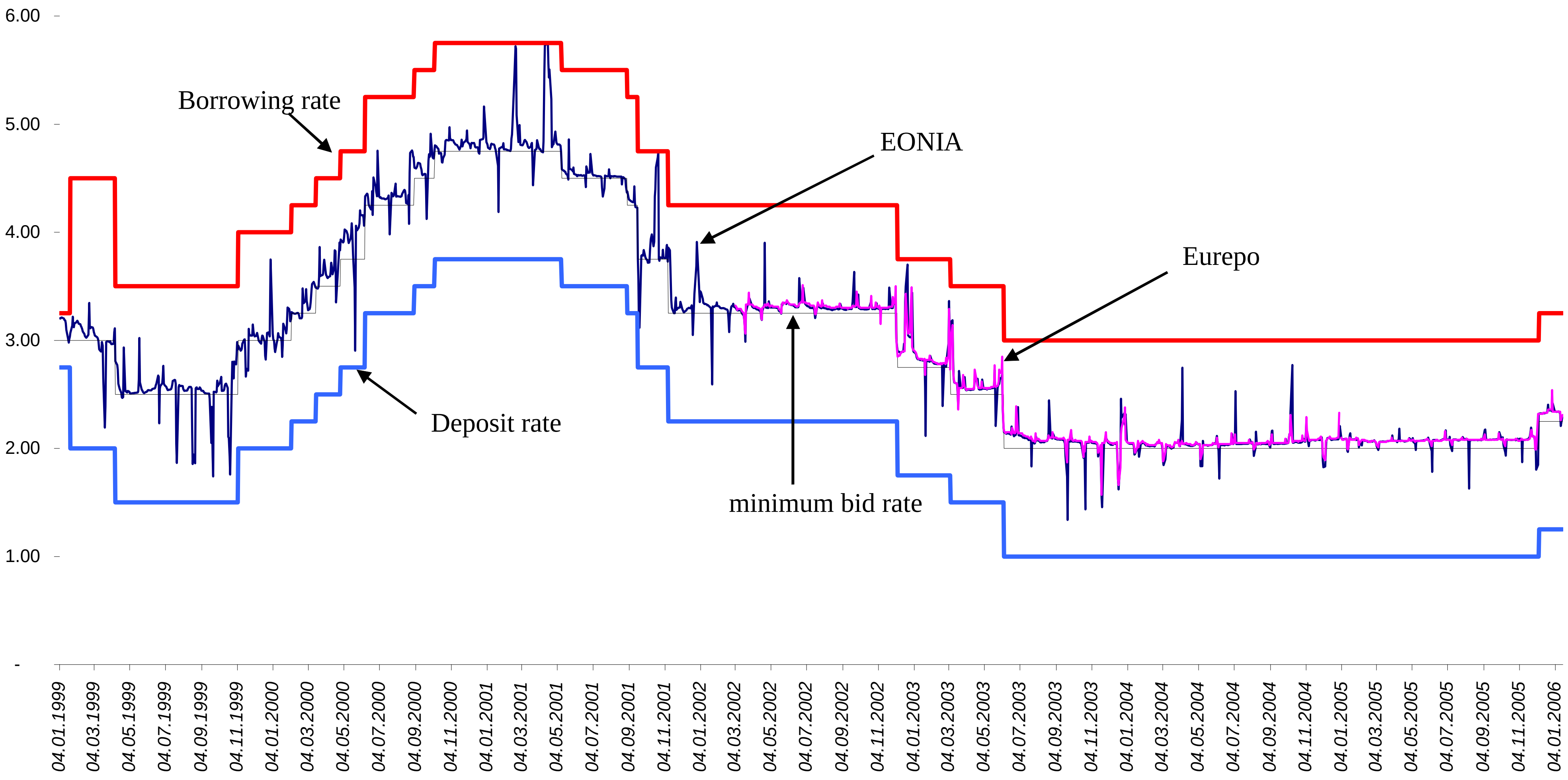
Figure 1: Interest-rate channel of the European Central Bank

EONIA (Euro OverNight Index Average) and Eurepo (reference rate for the Euro GC repo market)

Source: European Banking Federation and ECB



Features

- All loans are secured with collateral (typically REPOS)

- Stock of money endogenous (few open market operations)

- Money market

Objectives

- What is the optimal interest-rate corridor?

- Shift of corridor vs. changing the size?

- What do collateral requirements imply for the optimal policy?

- How does monetary policy without open market operations work?

Central banks operating a channel system

- New Zealand
- England
- Canada
- ECB
- FED

Environment

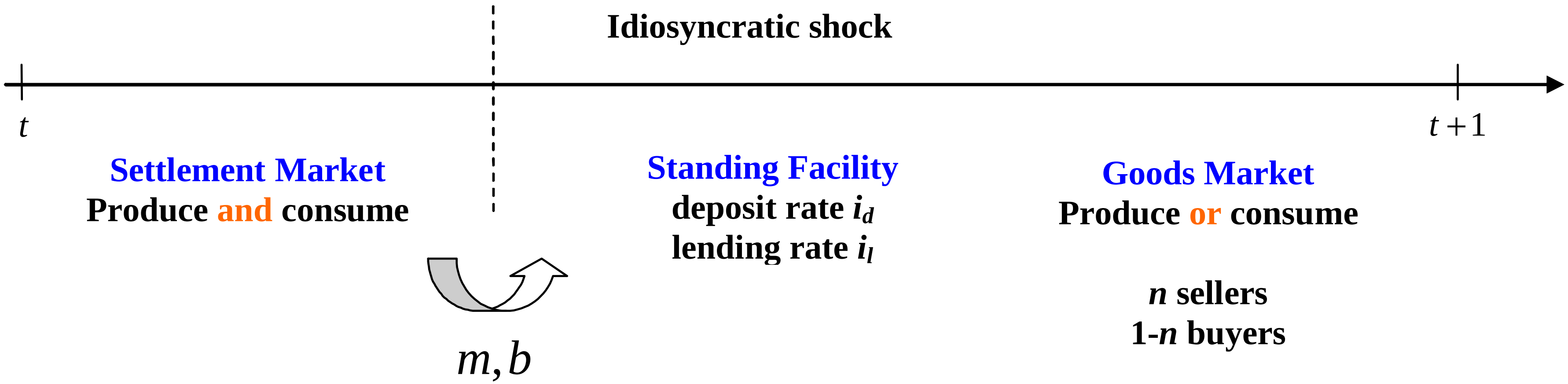
- General equilibrium model with microfoundations for money

- Time discrete.

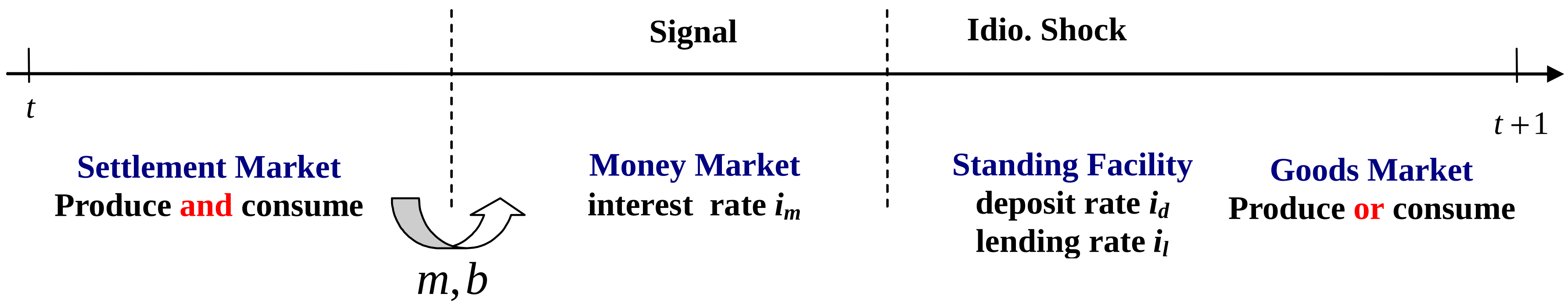
- $[0, 1]$ continuum of ∞-lived **agents**.

- Walrasian markets that open/close sequentially, in each t.

Sequence without money market



Sequence with money market



Production and Consumption

Settlement market: Settle financial claims, trade collateral. Consume/produce general good.

- Get $-h$ utility if h units are produced.
- Get h utility if h units are consumed.

Money Market: Adjust money holdings. No production/consumption.

Goods market: Consume **or** produce perishable good

- Produce with probability n at costs $c(q_s) = q_s$
- Consume with probability $1 - n$ and get $u(q)$

Collateral

- General goods can be stored.
- Return in $t+1$ is $R \geq 1$ with $\beta R < 1$.
- If liquidated in t, return is $R = 0$.

- *Only* central bank can verify collateral.
- Accepts stored general goods as collateral.

First-best allocation

Expected lifetime utility of a representative agent

$$(1-\beta)\mathcal{W} = (1-n)[u(q)-q] + (\beta R - 1)b$$

First best allocation (q^*, b^*), where:

- $u'(q^*) = 1$, and
- $b^* = 0$ if $\beta R < 1$.

Money

- Perfectly divisible, no holding restrictions.

- Central bank prints/burns paper money at not cost. Fiat.

- No lump-sum transfers.

- Endogenous growth rate

$$M_t = M_{t-1} - (1-n)i_\ell \ell_{t-1} + n i_d d_{t-1}.$$

Definition 1 *A symmetric stationary monetary equilibrium is a list* $(\gamma, q, z_\ell, z_m, b)$ *satisfying (1)-(5) with* $z_\ell \geq 0$ *and* $z_m \geq 0$.

$$\frac{1-\beta R}{\beta R} \geq (1-n)\left[u'(q)/\Delta - 1\right] \;\; (=0 \text{ if } b>0) \tag{1}$$

$$\frac{\gamma - \beta(1+i_d)}{\beta(1+i_d)} = (1-n)\left[u'(q) - 1\right] \tag{2}$$

$$\gamma = 1 + i_d - (1-n)(i_\ell - i_d)\frac{z_\ell}{z_m}, \tag{3}$$

$$q = z_m + z_\ell \tag{4}$$

$$z_\ell = \beta R b/\Delta \tag{5}$$

where $\Delta = (1+i_\ell)/(1+i_d)$.

Proposition 1 *For any $\Delta \geq 1$ there exists a unique symmetric stationary equilibrium such that*

$$\begin{array}{lll} z_\ell > 0 \text{ and } z_m = 0 & \text{if and only if} & \Delta = 1 \\ z_\ell > 0 \text{ and } z_m > 0 & \text{if and only if} & 1 < \Delta < \tilde{\Delta} \\ z_\ell = 0 \text{ and } z_m > 0 & \text{if and only if} & \Delta \geq \tilde{\Delta}. \end{array}$$

where

$$\tilde{\Delta} = \frac{1 - n\beta}{1/R - n\beta} \text{ and } \Delta = \frac{1 + i_\ell}{1 + i_d}.$$

Remarks

- Indeterminacy: Given allocation $(q(\Delta), b(\Delta))$, any pair (i_ℓ, i_d) satisfying $\Delta = \frac{1+i_\ell}{1+i_d}$ is consistent with this allocation.

- Increasing Δ reduces q and b.

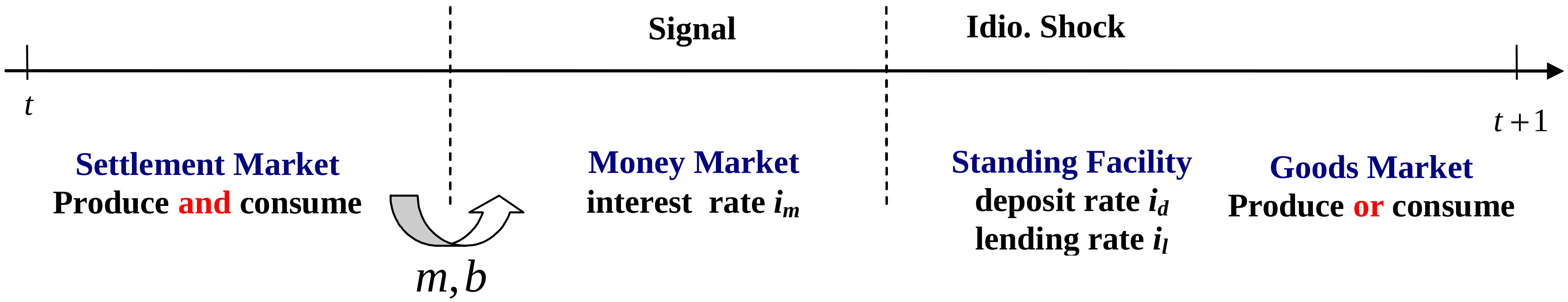
- Liquidity premium

$$V_b - \beta R > 0 \text{ if } \lambda_\ell > 0$$

Proposition 2 *There exists a critical value $\overline{R}$ such that if $R < \overline{R}$, then the optimal policy is $\Delta = \frac{1+i_\ell}{1+i_d} \geq \tilde{\Delta}$. Otherwise the optimal policy is $\Delta = \frac{1+i_\ell}{1+i_d} \in \left(1, \tilde{\Delta}\right)$.*

- Since $\beta R < 1$ it is **never** optimal to set a zero band.
- If $R < \overline{R}$, central bank chooses $b = 0$ and $q = \tilde{q}$.
- If $R > \overline{R}$, central bank chooses $b > 0$ and $\hat{q} > q > \tilde{q}$.

MONEY MARKET



Result: Policy

- Money market rate

$$i_m = i_\ell - n\beta R\delta = i_\ell - n\beta R(i_\ell - i_d)$$

- Shift of corridor moves money market rate i_m proportional.

- Increasing deposit rate i_d increases i_m but policy becomes less tight!!!!

- Increasing borrowing rate increases i_m and policy becomes tighter.

Result: ECB puzzle

- Money market rate

$$i_m = i_\ell - n\beta R(i_\ell - i_d)$$

- If $n = 1/2$ and $\beta R \to 1$, then $i_m \to (i_\ell + i_d)/2$.

- If $n = 1/2$ and $\beta R < 1$, then $i_m > (i_\ell + i_d)/2$ (ECB)

Result: Inflation

- Inflation from Fisher equation:

$$\gamma = \frac{1+i_m}{R} = \frac{1+i_\ell}{R} - n\beta(i_\ell - i_d)$$

- Steady state: higher interest rates $\Longrightarrow$ higher inflation

Final remarks

- Widespread belief that modeling the details of impementation a given interest-rate rule is unimportant
- Our analysis reveals that a characterization of optimal policy and its implementation cannot be separated.
- Any interest-rate rule in a system with zero deposit rate uniquely determines how "tight" or "loose" the policy is.
- The same rule has no meaning in a channel system since it does not determine whether a policy is "tight" or "loose."
- In a channel system, optimal policy must must state an interest-rate *corridor* rule.
- New insight, which goes beyond what we already know from literature on the optimal design of interest-rate rules.