Discussion of "Breaking the Spell with *Credit-Easing:* Self-Conforming Credit Crises in Competitive Search Economies" by Gaetano Gaballo and Ramon Marimon

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Summary of Results

1. The competitive search framework can help create the possibility of two self-conforming equilibria: a high risk (low credit) self-conforming equilibrium and a rational-expectations equilibrium with a safe investment project.
2. The inefficient equilibrium outcome can arise with the failure of private internalization: lack of private experimentations to attain the production of socially valuable information.
   - In the presence of uncertainty regarding the technological structure of firms' investment projects, private banks might not want to offer a low lending rate to firms even when a safe investment project with a low fixed cost is available for firms.
   - The high risk self-conforming equilibrium is sustainable under a set of plausible calibrations.
3. The central bank's *credit easing* can be interpreted as the experimentation of new markets, which helps produce a piece of information that is socially valuable.

Self-Conforming Equilibrium versus Self-Fulfilling Equilibrium

	GM model	BG model
Equilibrium concept	self-conforming low credit equilibrium	self-fulfilling credit freeze equilibrium
Main mechanism	persistent misperception	coordination failure
Low policy rate	partially effective	partially effective
Credit easing	effective	effective

Determination of Equilibrium Loan Rates: Bank's Optimization

1. Equilibrium Lending Rate in the High-Risk Equilibrium

$$\hat{R}_r = \arg \max_R 2^{\frac{-\gamma}{1-\gamma}} (\frac{A}{J_r^*})^{\frac{1}{1-\gamma}} \kappa(R,\alpha)^{\frac{1+\gamma}{1-\gamma}} (\alpha R - R_{CB})$$

where $\kappa(R,\alpha) = \alpha(y - R)$. The equilibrium lending rate in the high-risk equilibrium is

$$\hat{R}_r = \frac{(1-\gamma)y}{2} + \frac{(1+\gamma)R_{CB}}{2\alpha}.$$

2. Equilibrium Lending Rate in the Low-Risk Equilibrium

$$\hat{R}_s = \arg \max_R 2^{\frac{-\gamma}{1-\gamma}} (\frac{A}{J_s^*})^{\frac{1}{1-\gamma}} \kappa(R,1)^{\frac{1+\gamma}{1-\gamma}} (R - R_{CB})$$

where $\kappa(R,1) = y - k - R$. The equilibrium lending rate in the low-risk equilibrium is

$$\hat{R}_s = \frac{(1-\gamma)(y-k)}{2} + \frac{(1+\gamma)R_{CB}}{2}.$$

Firm's Behavior

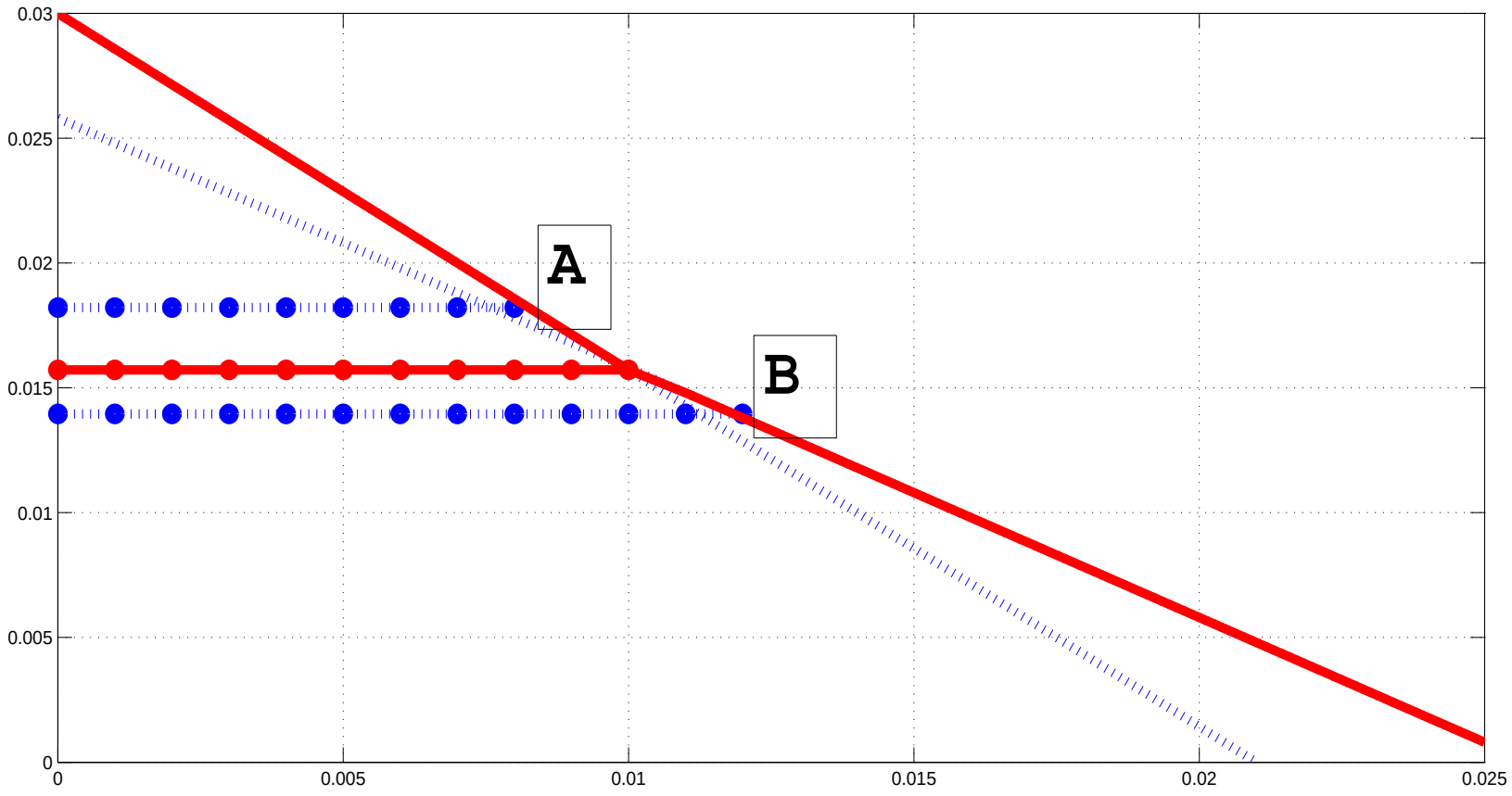
1. The behavior of an individual firm can be described by a kinked supply curve:

$$R = \begin{cases} y - I/\alpha & \text{if } \hat{R}_r > \bar{R} \\ y - k - I & \text{if } \hat{R}_s \leq \bar{R} \end{cases}$$

2. The first line corresponds to the case in which the firm chooses a risky investment project.
3. The second line corresponds to the case in which the firm choose a safe investment project.
4. There is a threshold interest rate for firm's choice between risky and safe investment projects:

$$\bar{R} = \max\{y - \frac{k}{1-\alpha}, R_{CB}\}.$$

Firm's Choice between Risky and Safe Investment Projects



Bank's Payoff under its Deviation from Self-Conforming Equilibrium

1. Deviation from the high-risk self-conforming equilibrium

$$D_H = \begin{array}{l} c\left(\frac{\kappa(R,\alpha)}{\kappa(\hat{R}_r,\alpha)}\right)^{\frac{1+\gamma}{1-\gamma}} \frac{\alpha R - R_{CB}}{\alpha \hat{R}_r - R_{CB}} - c \text{ with risky investment projects} \\ c\left(\frac{\kappa(R,1)}{\kappa(\hat{R}_r,\alpha)}\right)^{\frac{1+\gamma}{1-\gamma}} \frac{R - R_{CB}}{\alpha \hat{R}_r - R_{CB}} - c \text{ with safe investment projects} \end{array}$$

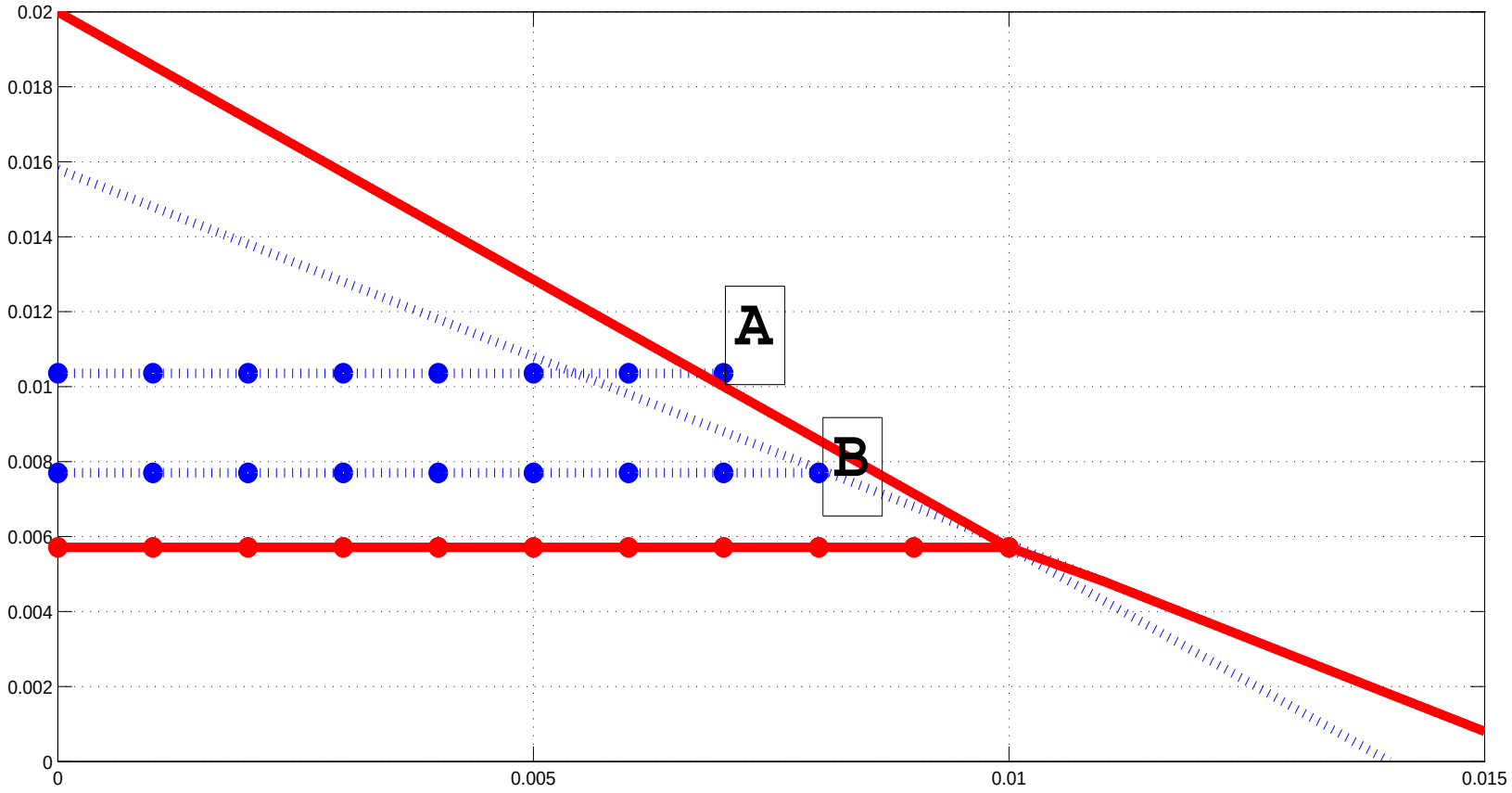
2. $D_H =$ - c for $R < R_{CB}/\alpha$ when firms choose a risky investment project.
3. This situation takes place with $k = 0.007$ for the safe investment project.
4. Definitions

$$\begin{aligned} \kappa(R,\alpha) &= \alpha(y - R) \\ \kappa(R,1) &= y - k - R \\ \hat{R}_r &= \frac{(1-\gamma)y}{2} + \frac{(1+\gamma)R_{CB}}{2\alpha} \\ \bar{R} &= y - \frac{k}{1-\alpha} \end{aligned}$$

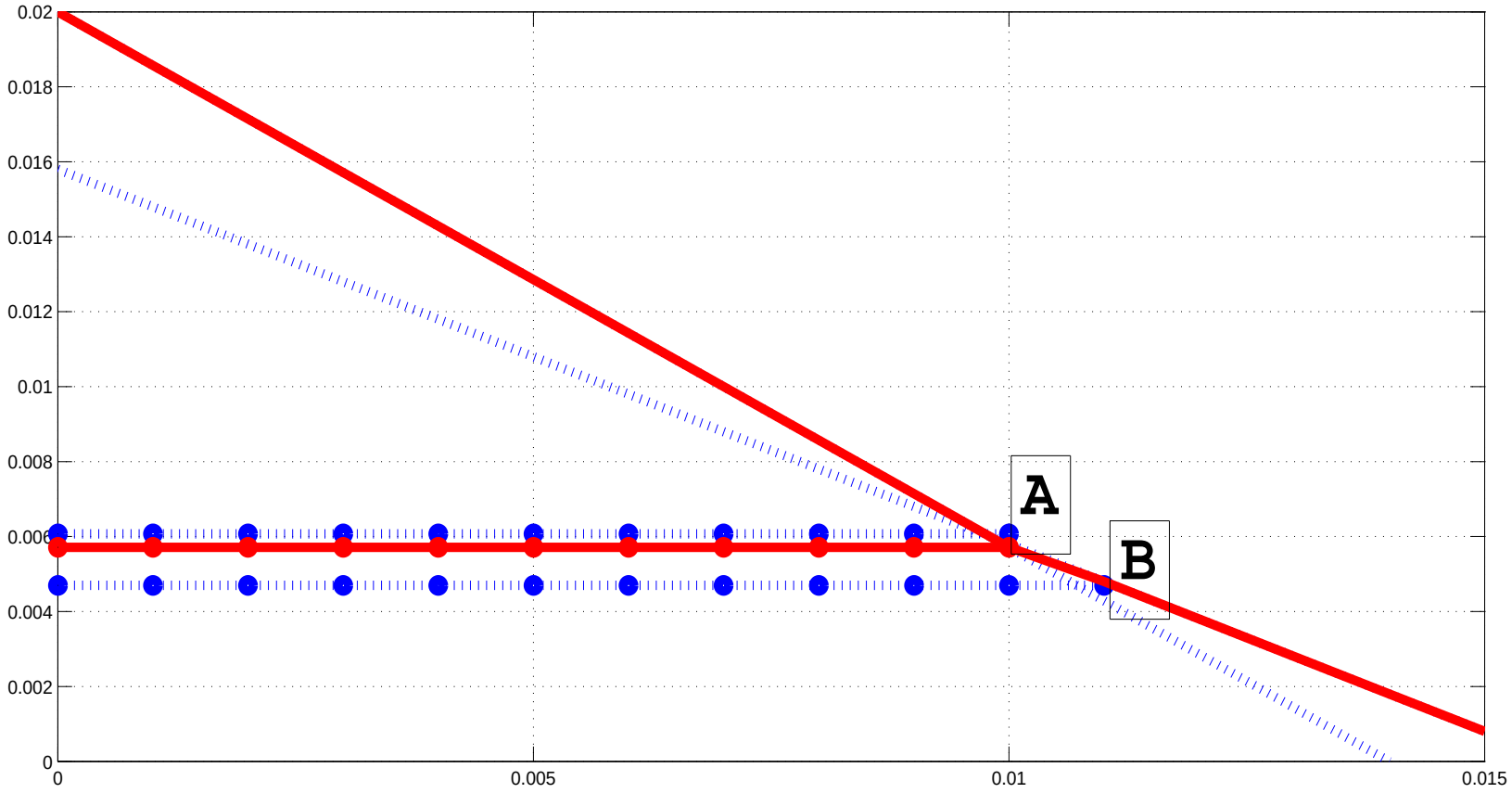
Effect of Conventional Monetary Policy

1. If the central bank lowers its policy rate enough, it is possible to eliminate the high-risk self-conforming equilibrium
   - The central bank lowers the cost of money from $R_{CB} = 0.01$ to $R_{CB} = 0.005$ in Figure 3.
   - In this case, the investment return is $y = 0.03$.
2. However, when investment return becomes low enough, a low policy rate may not be effective.
   - The central bank lowers the cost of money from $R_{CB} = 0.01$ to $R_{CB} = 0.005$ in Figure 4.
   - In this case, the investment return is $y = 0.02$.
3. Under the current calibration, it is still possible to find a level of the central bank's policy rate that eliminates the high-risk self-conforming equilibrium, even when the investment return is set to be $y = 0.02$.
   - The central bank lowers the cost of money from $R_{CB} = 0.01$ to $R_{CB} = 0.001$.
   - In this case, the investment return is $y = 0.02$.

Effect of a Low Policy Rate $R_{CB} = 0.005$: Low Investment Return



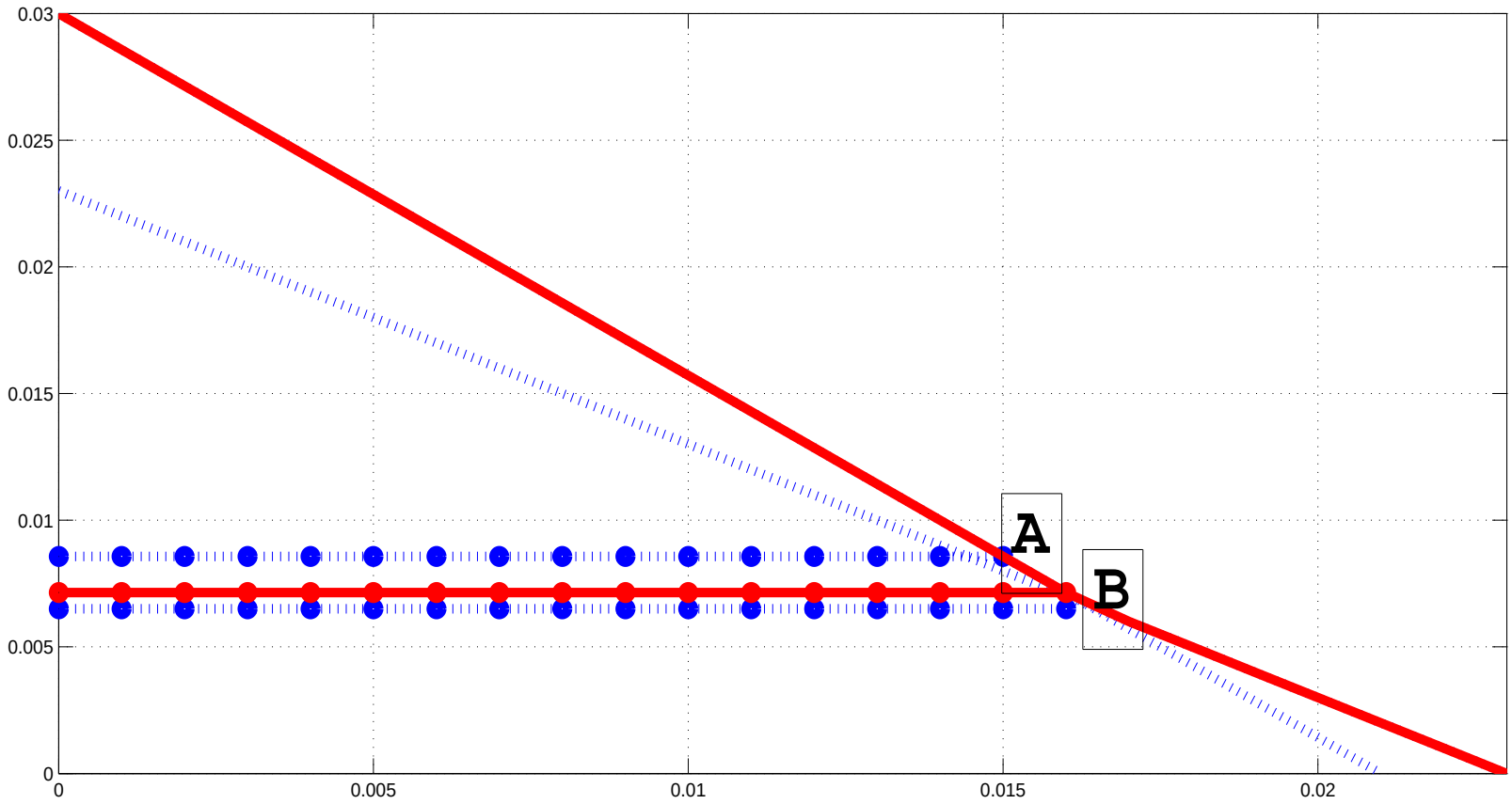
Effect of a Low Policy Rate $R_{CB} = 0.001$: Low Investment Return



Effect of Conventional Monetary Policy: High Fixed Cost

1. The high-risk equilibrium alone survives when the fixed cost for the safe investment project is high enough.
   - The self-conforming equilibrium with the risky investment project is the unique rational-expectations equilibrium when the high fixed cost alone is available to firms ($k_h = 0.007$) and $R_{CB} = 0.01$.
   - This situation corresponds to Figure 2.
2. However, the equilibrium with the safe investment project (high fixed cost $k_h = 0.007$) becomes the unique rational-expectations equilibrium when the central bank lowers its policy rate from $R_{CB} = 0.01$ to $R_{CB} = 0.001$.
3. This result might be important when we want to understand how conventional monetary policy can be combined with unconventional monetary policy in this framework.

Effect of a Low Policy Rate $R_{CB} = 0.001$: High Fixed Cost



Motivation of an Alternative Arrangement for the Central Bank's Lending Program

1. In this paper, the effect of "credit easing" is analyzed without lowering the central bank's policy rate ($R_{CB} = 0.01$).
2. Alternatively, the central bank's lending program can target only riskless corporate bonds as its collateral after the central bank lowers the policy rate.
3. The main reason behind this argument is that the equilibrium with the safe investment project (high fixed cost $k_h = 0.007$) becomes the unique rational-expectations equilibrium when the central bank lowers its policy rate from $R_{CB} = 0.01$ to $R_{CB} = 0.001$.
4. The central bank's lending program is available for banks only when riskless corporate bonds are provided as collateral.

Effect of a Low Policy Rate on Interest Rates

1. $R_{CB} = 0.01$, $y = 0.03$, $\gamma = 0.5$, and $k = 0.0042$

$$\begin{aligned}
\hat{R}_r &= (0.5/2)0.03 + 0.01(1.5/1.4) &&= 0.0182 \\
\hat{R}_s &= (0.5/2)(0.03 - 0.0042) + 0.01(1.5/2) &&= 0.0140 \\
\bar{R} &= 0.03 - 0.0042/0.3 &&= 0.0160
\end{aligned}$$

2. $R_{CB} = 0.01$, $y = 0.03$, $\gamma = 0.5$, and $k = 0.007$

$$\begin{aligned}
\hat{R}_r &= (0.5/2)0.03 + 0.01(1.5/1.4) &&= 0.0182 \\
\hat{R}_s &= (0.5/2)(0.03 - 0.007) + 0.01(1.5/2) &&= 0.0133 \\
\bar{R} &= 0.03 - 0.007/0.3 &&= 0.0067
\end{aligned}$$

3. $R_{CB} = 0.001$, $y = 0.03$, $\gamma = 0.5$, and $k = 0.007$

$$\begin{aligned}
\hat{R}_r &= (0.5/2)0.03 + 0.001(1.5/1.4) &&= 0.0086 \\
\hat{R}_s &= (0.5/2)(0.03 - 0.007) + 0.001(1.5/2) &&= 0.0065 \\
\bar{R} &= 0.03 - 0.007/0.3 &&= 0.0067
\end{aligned}$$

Effect of Collateral Requirement: Term Asset-Backed Securities Lending Facility

1. Let us suppose that the true state of the world is a low fixed cost for the safe investment project. The probability that private banks put on the state of a low fixed cost is ζ.
2. When the private ABS market freezes, the central bank announces that only riskless corporate bonds can be used as collateral for its lending facility. The central bank also lowers its policy rate.
   - The self-conforming equilibrium with the risky investment project is the unique rational-expectations equilibrium when the high fixed cost alone is available to firms ($k_h = 0.007$) and $R_{CB} = 0.01$
   - The self-conforming equilibrium with the safe investment project (high fixed cost $k_h = 0.007$) becomes the unique rational-expectations equilibrium when the central bank lowers its policy rate from $R_{CB} = 0.01$ to $R_{CB} = 0.001$.
3. As a result, potential demands for TALF exist in both cases of low and high fixed costs.

Expected Welfare Gain of TALF with Collateral Requirement

1. The expected welfare gain of TALF with collateral requirement is given by

$$\Delta W_t = \frac{1}{2}(\zeta(y - k_l - R_d)^2 + (1 - \zeta)(y - k_h - R_d)^2)$$

where R_d is set to be

$$R_d = \frac{1 - \gamma}{2}(y - k) + \frac{1 + \gamma}{2} R_{CB}.$$

2. TALF is available only when riskless corporate bonds are provided as collateral.
3. Under the current calibration, it is possible to lower the cost of money enough to lead firms to choose the safe investment with a high fixed cost.

Loan Commitment

1. A substantial fraction of commercial and industrial loans are made under loan commitment contracts.
2. A loan commitment gives firms the option to borrow at any time point time within the period of the contract, up to the predetermined limit.
3. A matching framework can be used to model long-term financing arrangements that banks negotiate with firms.
4. By introducing an exogenous separation rate, it might be possible to turn this model into a dynamic model of loan contract between banks and firms.

A Bank's Optimization

1. High Risk Equilibrium

$$V_r^* = \max_f H_1(\alpha) f(R_{CB}, \alpha, y)^{\frac{1+\gamma}{1-\gamma}} - H_{2,r} f(R_{CB}, \alpha, y)^{\frac{2}{1-\gamma}}$$

where $H_1(\alpha) = H_2(\alpha y - R_{CB})$ and $H_{2,r} = 2^{\frac{-\gamma}{1-\gamma}} (\frac{A}{J_r^*})^{\frac{1}{1-\gamma}}$.

$$f(R_{CB}, \alpha, y) = (1+\gamma)(\alpha y - R_{CB})/2$$

2. Low Risk Equilibrium

$$V_s^* \max_f H_1(k) f(R_{CB}, k, y)^{\frac{1+\gamma}{1-\gamma}} - H_{2,s} f(R_{CB}, k, y)^{\frac{2}{1-\gamma}}$$

where $H_1(k) = H_2(y - k - R_{CB})$ and $H_{2,s} = 2^{\frac{-\gamma}{1-\gamma}} (\frac{A}{J_s^*})^{\frac{1}{1-\gamma}}$.

$$f(R_{CB}, k, y) = (1+\gamma)(y - k - R_{CB})/2.$$

Value Functions

1. High Risk Equilibrium

$$V_r^* = \frac{1-\gamma}{1+\gamma} H_{2,r} f(R_{CB}, \alpha, y)^{\frac{2}{1-\gamma}}$$

where $H_{2,r} = 2^{\frac{-\gamma}{1-\gamma}} (\frac{A}{J_r^*})^{\frac{1}{1-\gamma}}$.

$$f(R_{CB}, \alpha, y) = (1+\gamma)(\alpha y - R_{CB})/2$$

2. Low Risk Equilibrium

$$V_s^* = \frac{1-\gamma}{1+\gamma} H_{2,s} f(R_{CB}, k, y)^{\frac{2}{1-\gamma}}$$

where $H_{2,s} = 2^{\frac{-\gamma}{1-\gamma}} (\frac{A}{J_s^*})^{\frac{1}{1-\gamma}}$.

$$f(R_{CB}, k, y) = (1+\gamma)(y - k - R_{CB})/2.$$

Bank's Payoffs: Deviations from Self-Conforming Equilibria

1. Deviation from the High Risk Equilibrium

$$
\begin{aligned}
D(R,\alpha) &= c\left(\tfrac{1+\gamma}{1-\gamma}\right)\left(\tfrac{\kappa(R,\alpha)}{\kappa(\hat{R}_r,\alpha)}\right)^{\frac{2}{1-\gamma}}\left(\tfrac{2\kappa(\hat{R}_r,\alpha)}{(1+\gamma)\kappa(R,\alpha)}-1\right)-c && \text{if } R>\bar{R}\\
&\quad c\left(\tfrac{1+\gamma}{1-\gamma}\right)\left(\tfrac{\kappa(R,1)}{\kappa(\hat{R}_r,\alpha)}\right)^{\frac{2}{1-\gamma}}\left(\tfrac{2\kappa(\hat{R}_r,\alpha)}{(1+\gamma)\kappa(R,1)}-1\right)-c && \text{if } R\le\bar{R}
\end{aligned}
$$

2. Deviation from the Low Risk Equilibrium

$$
\begin{aligned}
D(R,\alpha) &= c\left(\tfrac{1+\gamma}{1-\gamma}\right)\left(\tfrac{\kappa(R,\alpha)}{\kappa(\hat{R}_s,1)}\right)^{\frac{2}{1-\gamma}}\left(\tfrac{2\kappa(\hat{R}_s,1)}{(1+\gamma)\kappa(R,\alpha)}-1\right)-c && \text{if } R>\bar{R}\\
&\quad c\left(\tfrac{1+\gamma}{1-\gamma}\right)\left(\tfrac{\kappa(R,1)}{\kappa(\hat{R}_s,1)}\right)^{\frac{2}{1-\gamma}}\left(\tfrac{2\kappa(\hat{R}_s,1)}{(1+\gamma)\kappa(R,1)}-1\right)-c && \text{if } R\le\bar{R}
\end{aligned}
$$

$$
\begin{aligned}
\kappa(R,\alpha) &= \alpha(y-R)\\
\kappa(R,1) &= y-k-R\\
\hat{R}_r &= \frac{(1-\gamma)y}{2}+\frac{(1+\gamma)R_{CB}}{2\alpha}\\
\hat{R}_s &= \frac{(1-\gamma)(y-k)}{2}+\frac{(1+\gamma)R_{CB}}{2}\\
\bar{R} &= y-\frac{k}{1-\alpha}
\end{aligned}
$$

Bank's Payoffs: Deviations from Self-Conforming Equilibria

1. Deviation from the High Risk Equilibrium

$$F(\alpha) = \begin{cases} c(\frac{1+\gamma}{1-\gamma})(\frac{f(\alpha)}{f_r^*})^{\frac{2}{1-\gamma}}(\frac{2f_r^*}{(1+\gamma)f(\alpha)} - 1) - c & \text{if } f < \bar{f} \\ c(\frac{1+\gamma}{1-\gamma})(\frac{f(1)}{f_r^*})^{\frac{2}{1-\gamma}}(\frac{2f_r^*}{(1+\gamma)f(1)} - 1) - c & \text{if } f \geq \bar{f} \end{cases}$$

2. Deviation from the Low Risk Equilibrium

$$F(1) = \begin{cases} c(\frac{1+\gamma}{1-\gamma})(\frac{f(\alpha)}{f_s^*})^{\frac{2}{1-\gamma}}(\frac{2f_s^*}{(1+\gamma)f(\alpha)} - 1) - c & \text{if } f < \bar{f} \\ c(\frac{1+\gamma}{1-\gamma})(\frac{f(1)}{f_s^*})^{\frac{2}{1-\gamma}}(\frac{2f_s^*}{(1+\gamma)f(1)} - 1) - c & \text{if } f \geq \bar{f} \end{cases}$$

$$f_r^* = (1+\gamma)(\alpha y - R_{CB})/2; \quad f_s^* = (1+\gamma)(y - k - R_{CB})/2.$$

Dynamic Optimization for Loan Contracts

1. High Risk Equilibrium

$$\max_{f_t} E_t[\sum_{k=0}^{\infty}(\sigma\beta)^k \Lambda_{t,t+k}(H_{1,t+k} f_t^{\frac{1+\gamma}{1-\gamma}} - H_{2,t+k} f_t^{\frac{2}{1-\gamma}})]$$

where $H_{1,t} = H_{2,t}(\alpha_t y_t - R_{CB})$ and $H_{2,t} = 2^{\frac{-\gamma}{1-\gamma}}(\frac{A_t}{J^*_{t,r}})^{\frac{1}{1-\gamma}}$.

2. Low Risk Equilibrium

$$\max_{f_t} E_t[\sum_{k=0}^{\infty}(\sigma\beta)^k \Lambda_{t,t+k}(V_{1,t+k} f_t^{\frac{1+\gamma}{1-\gamma}} - V_{2,t+k} f_t^{\frac{2}{1-\gamma}})]$$

where $V_{1,t} = H_{2,t}(y_t - k_t - R_{CB})$ and $H_{2,t} = 2^{\frac{-\gamma}{1-\gamma}}(\frac{A_t}{J^*_{s,t}})^{\frac{1}{1-\gamma}}$.