The Credit Channel of Monetary Policy I

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- Here: Is the financial sector important for *the way the interest rate affects the economy*?
- Standard: Sticky prices make nominal interest rate changes become real interest rate changes and exchange rate changes $=>$ real exchange rate changes
- Standard: Only two types of capital: Money and Bonds, no modelling of financial intermediation

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- Alternative measures implemented by central banks to help financial market functioning

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- Need more sophisticated modelling of financial markets, more assets than just M and B!

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- Here: study market for loans

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- First: micro-effects in isolation

Adverse selection and moral hazard (cont.)

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- You will loose money on some of these people, while one will be your best customer - can you tell them apart?

Adverse selection: the interest rate as a screening device

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Model by Stiglitz and Weiss (1981)

- Group of projects θ characterized by a distribution of return R, $\quad F(R, \theta)$. Risk increasing with θ.
- Get decreasing return in increasing interest rate r charged, because average θ increases in pool of projects that apply for funding: average risk increases. Why? Default if

$$C + R \leqslant B(1 + \widehat{r})$$

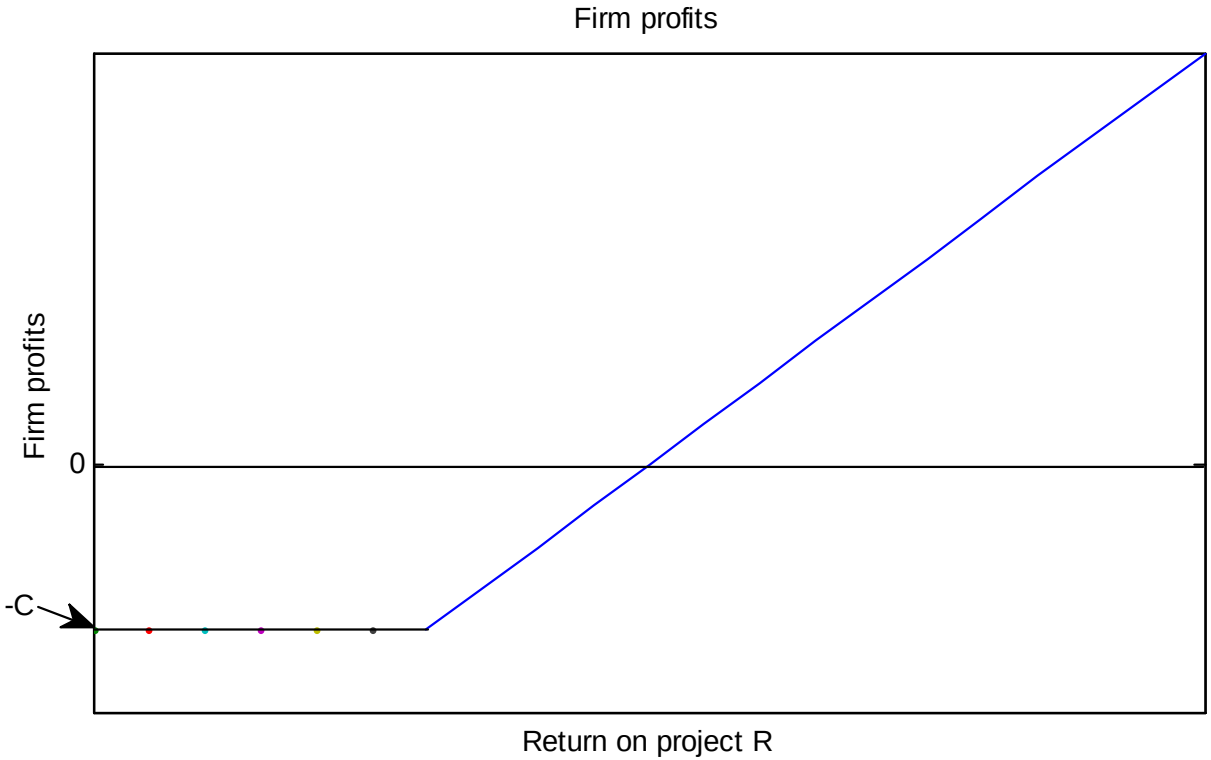
Net return to borrower:

$$\pi(R, \widehat{r}) = \max(R - (1 + \hat{r})B; -C)$$

Return to lender

$$\rho(R, r) = \min(R + C; B(1 + \hat{r}))$$

Firm profits convex function of R



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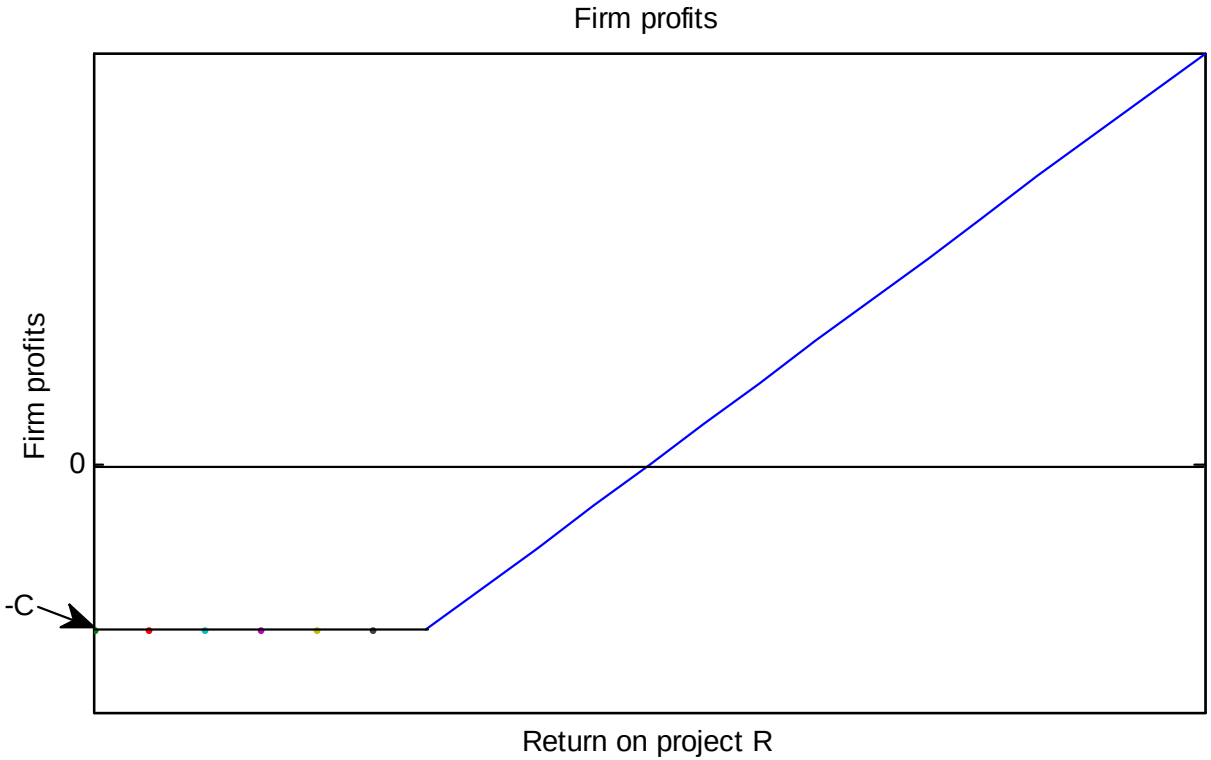

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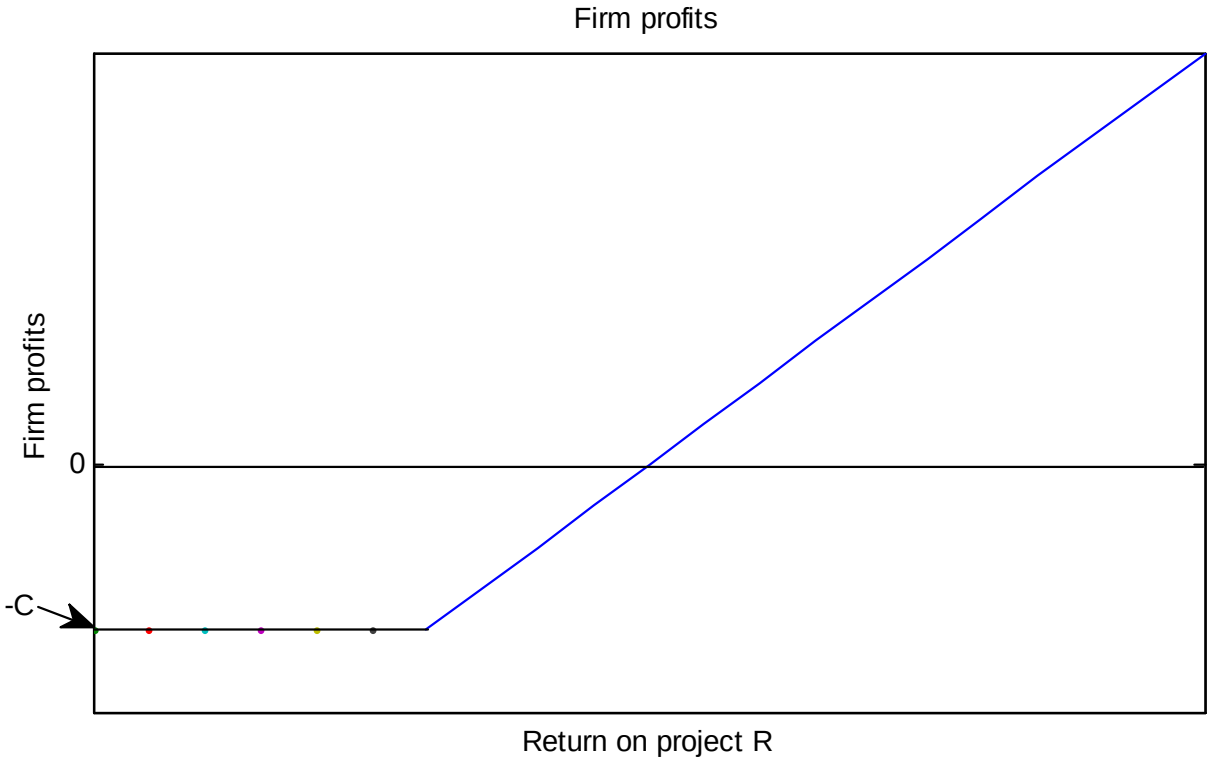

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- Firm will want to borrow from bank only if project is risky enough
- Downside is limited, upside increases with risk
- Implies that firm borrows from bank iff $\theta \geq \hat{\theta}$: Expected profit increases with risk (θ).

Funding for low-risk projects not wanted when r is high

Critical value of $\theta, \hat{\theta}$ with expected profit equal to zero (below $\hat{\theta}$, project not profitable):

$$E\Pi(\hat{r}, \hat{\theta}) \equiv$$

$$\int_0^{\infty} \max[R - (\hat{r}+1)B; -C] dF(R, \hat{\theta}) = 0$$

How does the critical $\hat{\theta}$ depend on $\hat{r}$? Use implicit function theorem to find $\frac{d\hat{\theta}}{d\hat{r}} > 0 =>$

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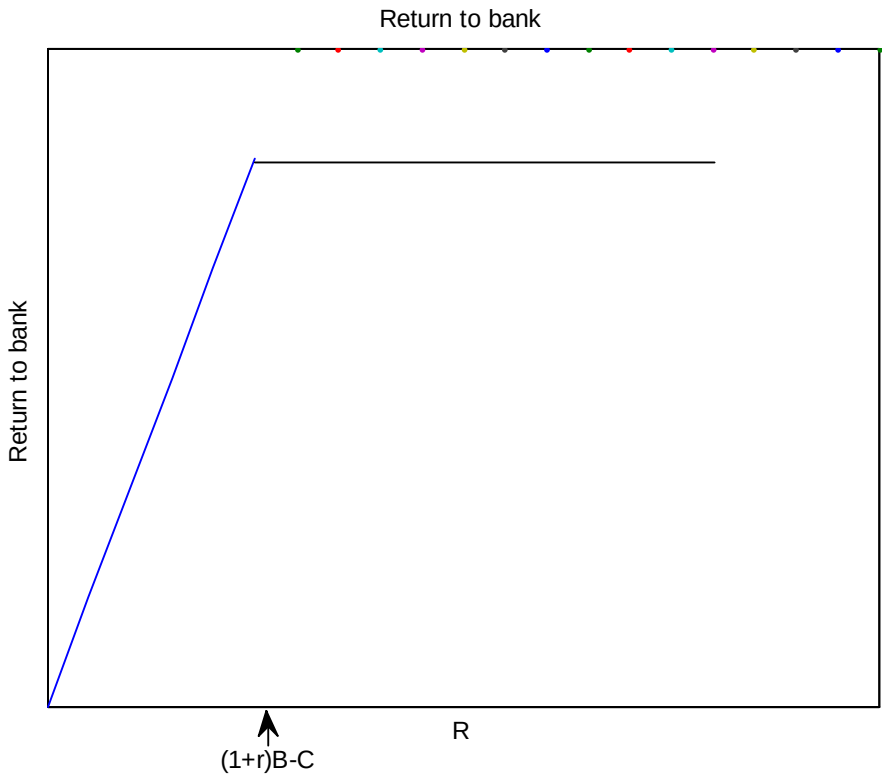
- When $r \uparrow$, low-risk projects do not apply for financing.
- Note also that return to bank is concave function of return on project$=>$ bank prefers less risk to a mean-preserving spread:

Bank return concave function of R



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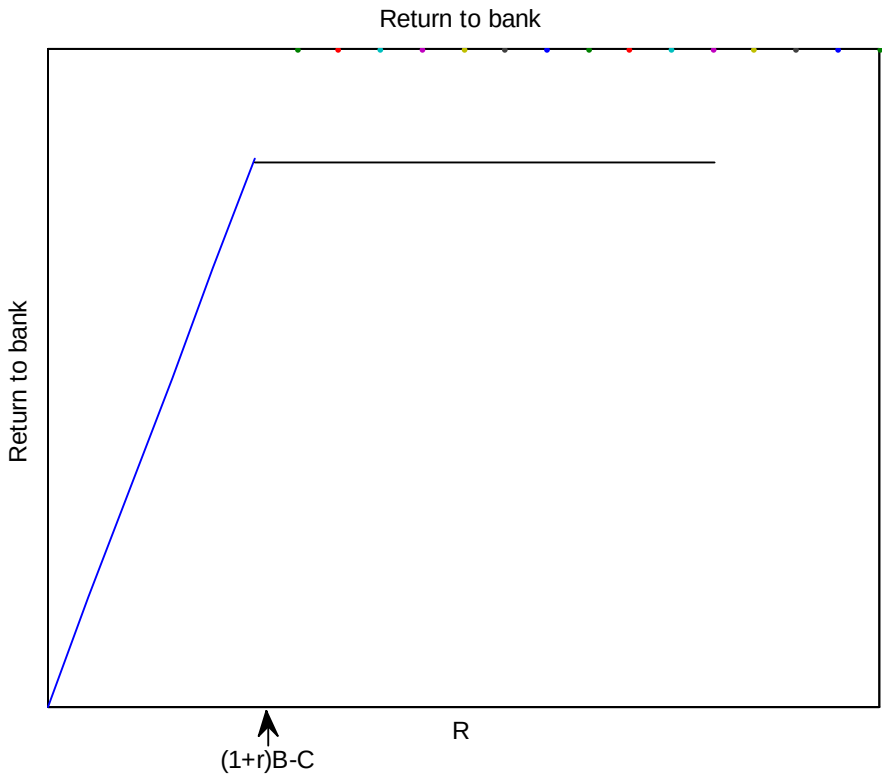

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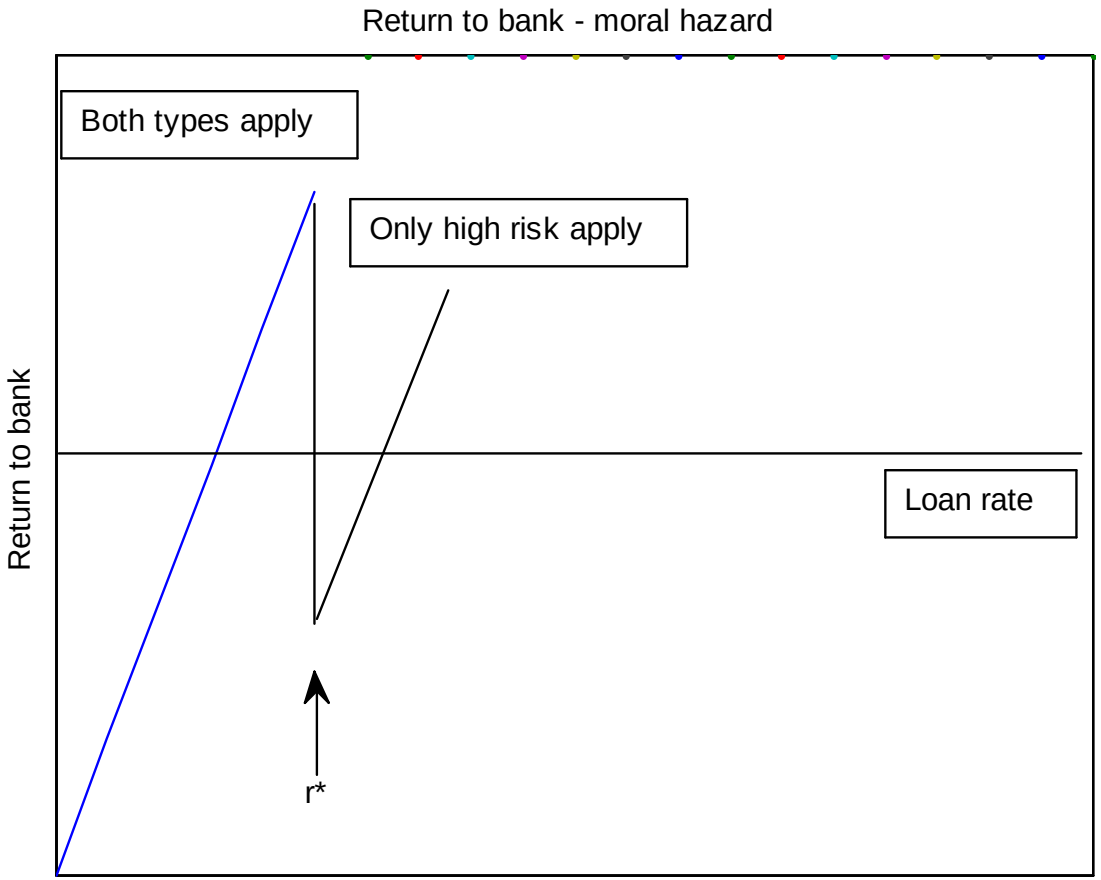
Case with two types of θ only (Walsh book)



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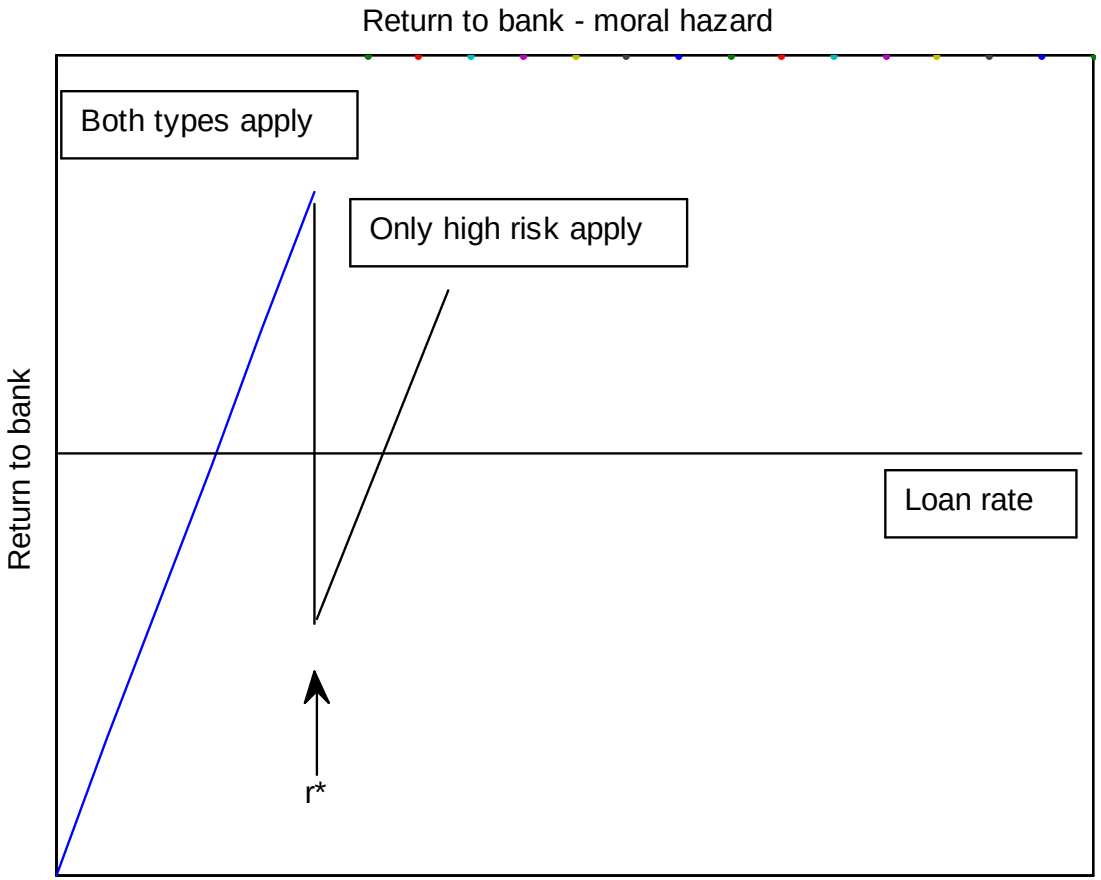

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Moral hazard: The interest rate as an incentive mechanism

- Borrower has convex profit function: incentive to take on more risk

Example

Suppose borrower can invest in project A or project B. B is more risky. Payoff: $R^a < R^b$ in "good state of the world", but probability $p^a > p^b$. In bad state of the world, payoff is 0 for both projects.

$$\begin{aligned} E\pi^A &= p^a[R^a - (1+r_l)B] - (1-p^a)C, \\ E\pi^B &= p^b[R^b - (1+r_l)B] - (1-p^b)C \end{aligned}$$

The interest rate that gives equal expected return for the two projects is characterized by:

$$(1+r_l^*)B - C = \frac{p^a R^a - p^b R^b}{p^a - p^b}$$

Interest rate above this rate=> project B is preferred =>profit to lender is

$$p^b(1+r_l^H)B+(1-p^b)C$$

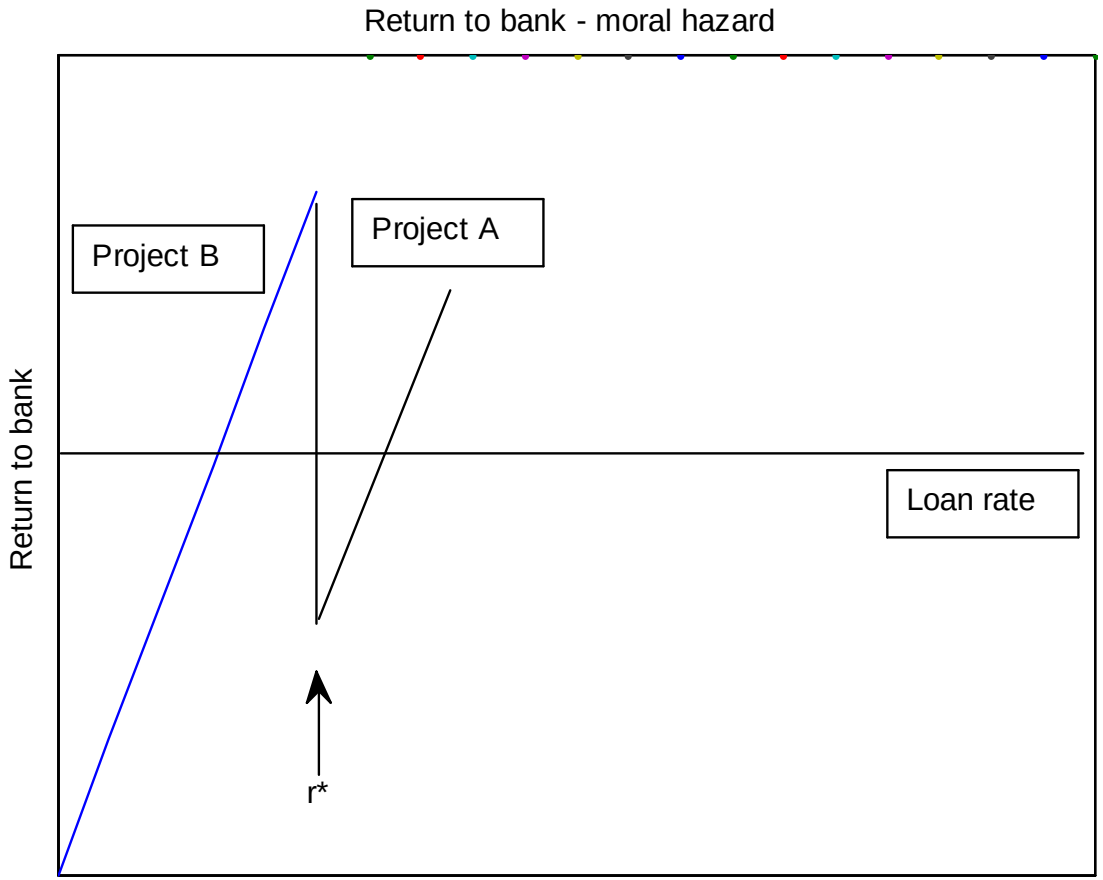
Interest rate below this rate=>project A is preferred=>profit to lender is

$$p^a(1+r_l^L)B+(1-p^a)C$$

Since in borderline case ($r=r_l^*$)

$$p^b(1+r_l^*)B+(1-p^b)C<p^a(1+r_l^*)B+(1-p^a)C$$

=> Lender will make sure r_l is (marginally below) r_l^*.



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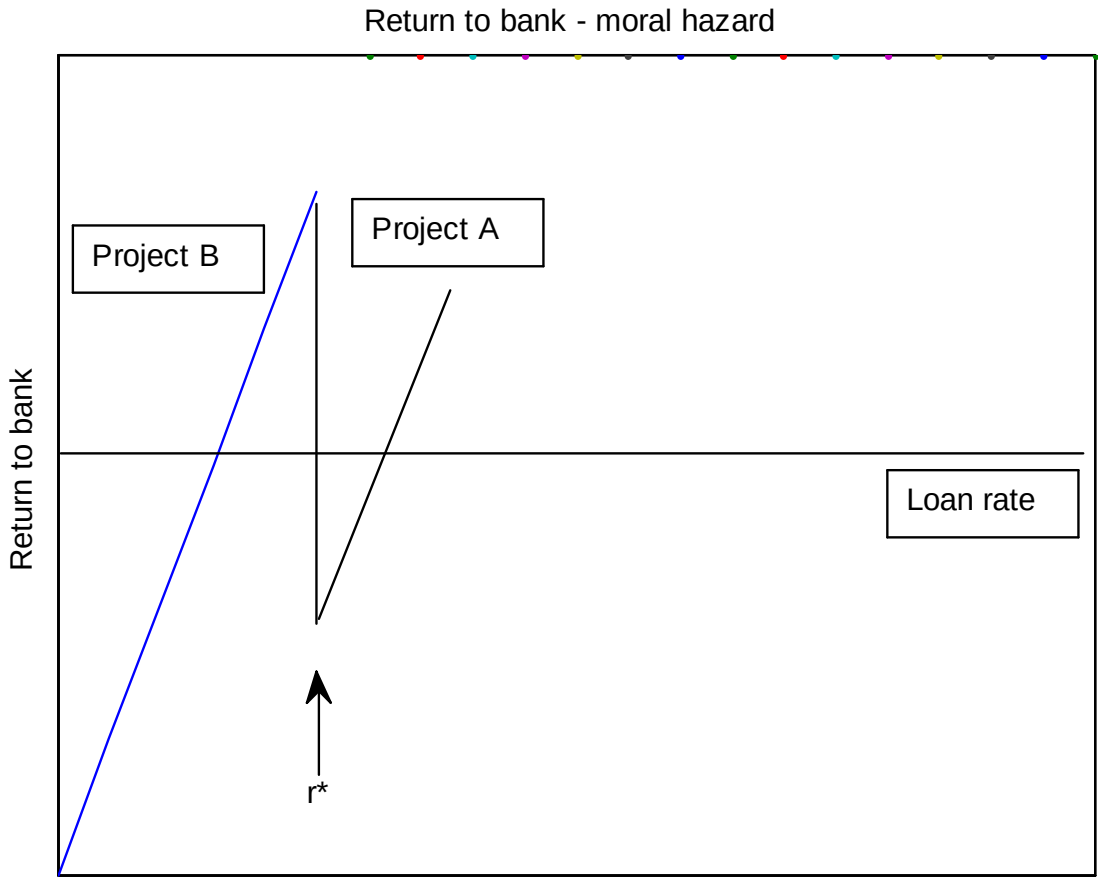

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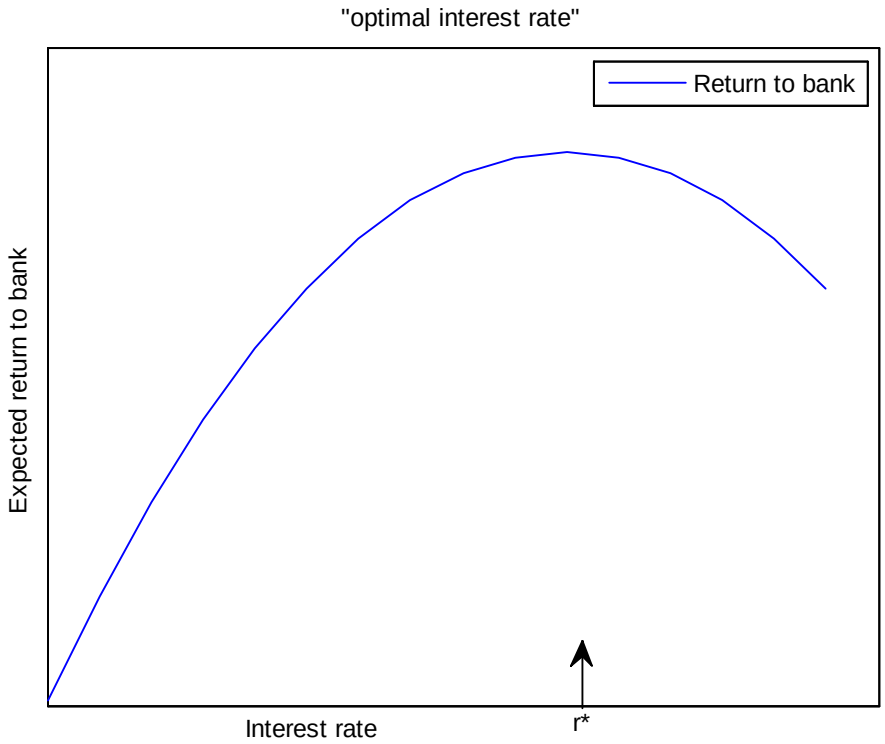

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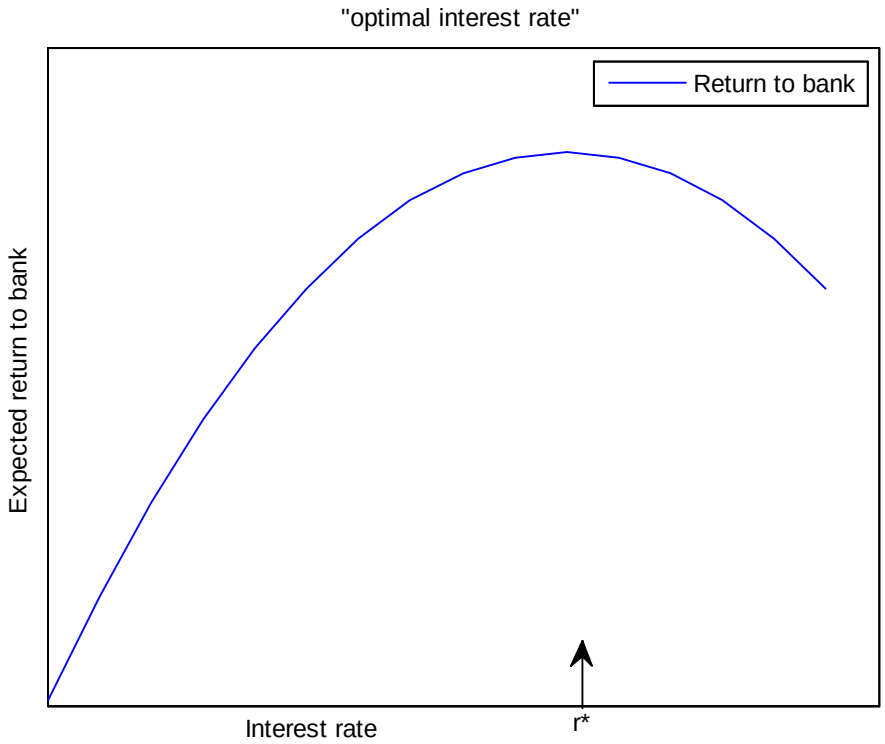

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- Ultimate question: how does monetary policy affect net worth/collateral and hence finance premium/availability of credit?

Example

Two periods, 0 and 1. Entrepreneur uses inputs from period 0 to produce in period 1. Fixed input K, variable input x_1.Market price of K at end of period is q_1 per unit. Output period 1: $a_1 f(x_1)$. Gross cashflow from previous production $a_0 f(x_0)$. Entrepreneur maximizes period 1 output net of debt, $a_1 f(x_1) - r_1 b_1$, subject to accounting identity

$$x_1 = a_0 f(x_0) + b_1 - r_0 b_0 \tag{1}$$

Unconstrained optimal value of x_1:

$$\underset{x1,b1}{Max}(a_1 f(x_1) - r_1 b_1) = \underset{b1}{Max}[a_1 f(a_0 f(x_0) + b_1 - r_0 b_0 - r_1 b_1)]$$

implies $x_1 = x_1^*$ such that

$$a_1 f'(x_1^*) = r_1$$

Example of financial accelerator cont

But borrowing is subject to constraint (no unsecured borrowing)

$$b_1 \leq (q_1 / r_1) K \tag{2}$$

Which implies

$$x_1 \leq a_0 f(x_0) + (q_1 / r_1) K - r_0 b_0 \tag{3}$$

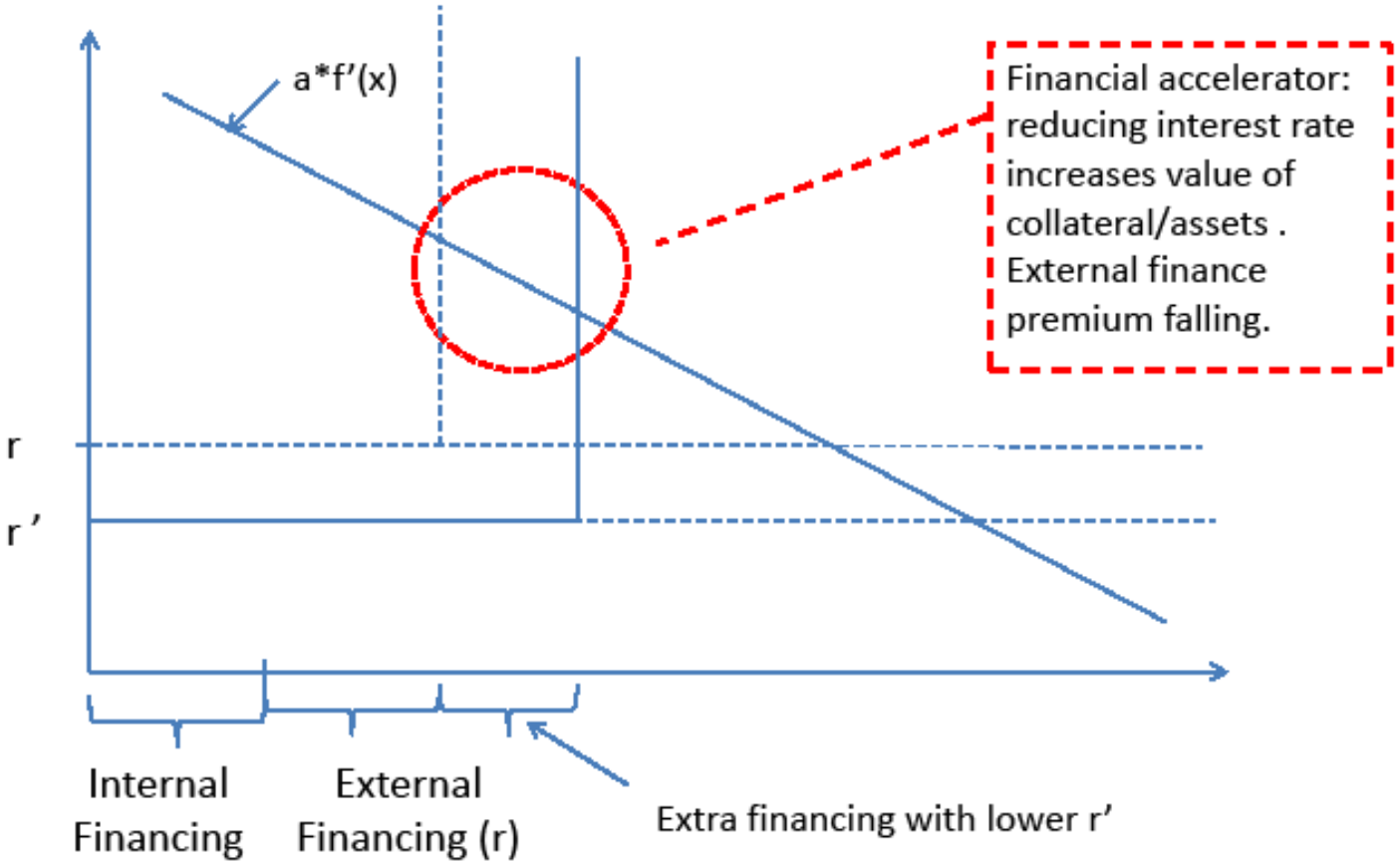
When x_1 is suboptimal,

$$x_1 < x_1^* \quad \Rightarrow a_1 f'(x_1) > r_1$$

($f(\cdot)$ is concave) $\Rightarrow$ Shadow price for internal funding $= a_1 f'(x_1)$, higher than r_1, reflects "agency costs".

Effects of monetary policy in financial accelerator model:

External finance premium, collateralized financing only



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- Negative demand shock reduces net worth =>downturn amplified by collateral-effects

Financial accelerator model central in discussion of financial crisis

- Definition of financial crisis: collateral constraint suddenly binding (Christiano, Rust, Roldos (2002)): Monetary Policy in a Financial Crisis, NBER WP9005

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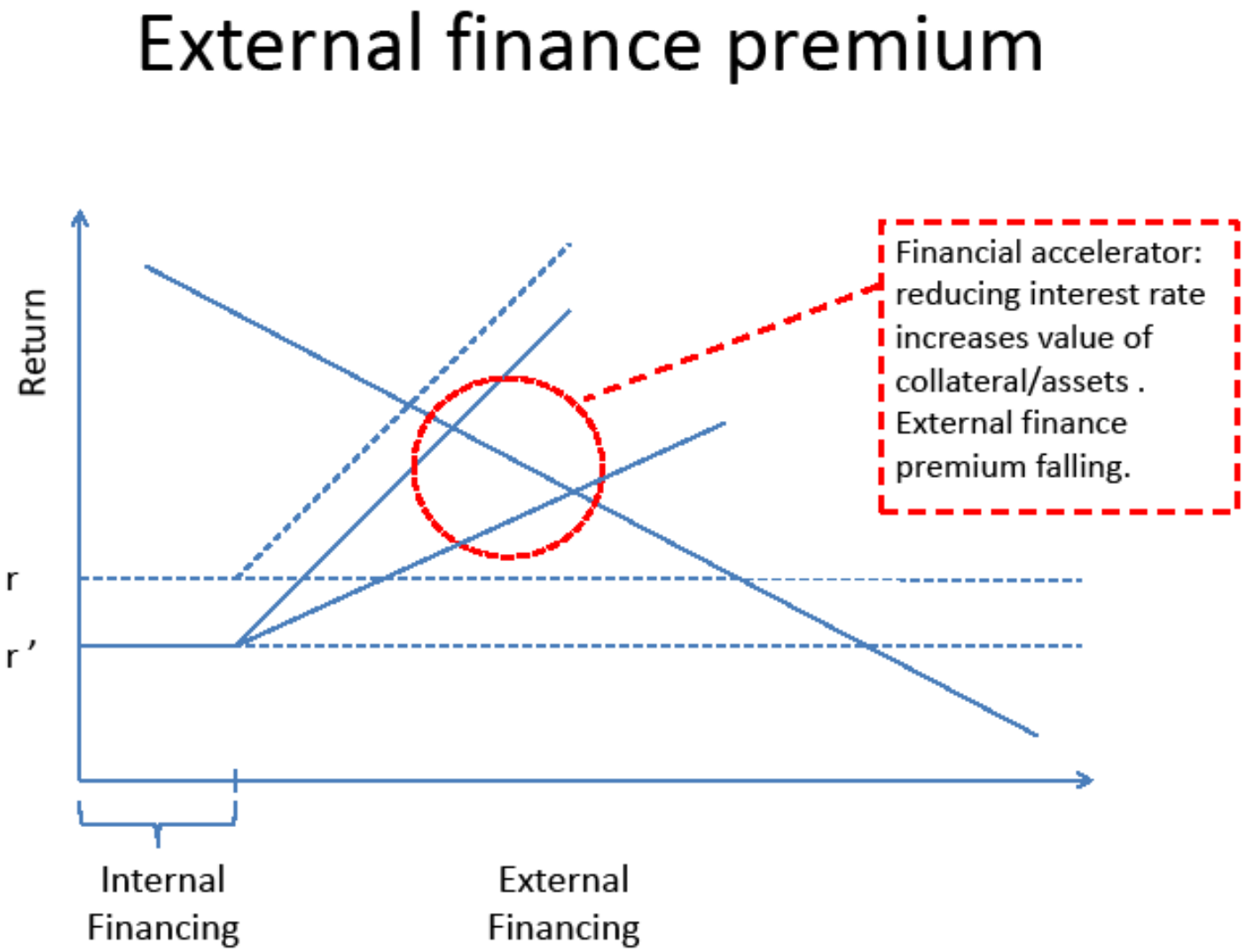
- Variants of the premium in many modern models of credit channel

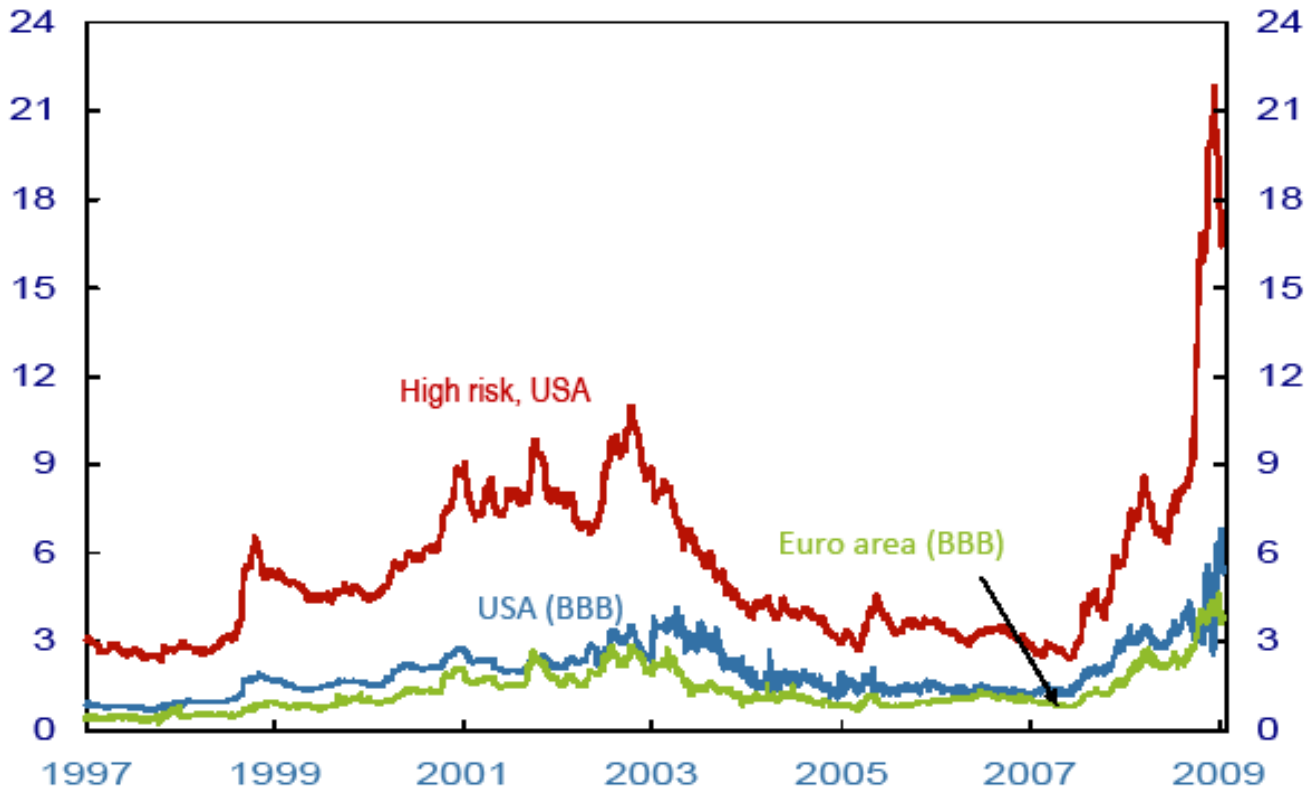
Model with less extreme collateral assumption



External finance premium

Premium on corporate bonds, the US and the euro area

Percentage points. 2. jan 1997 – 19. januar 2009



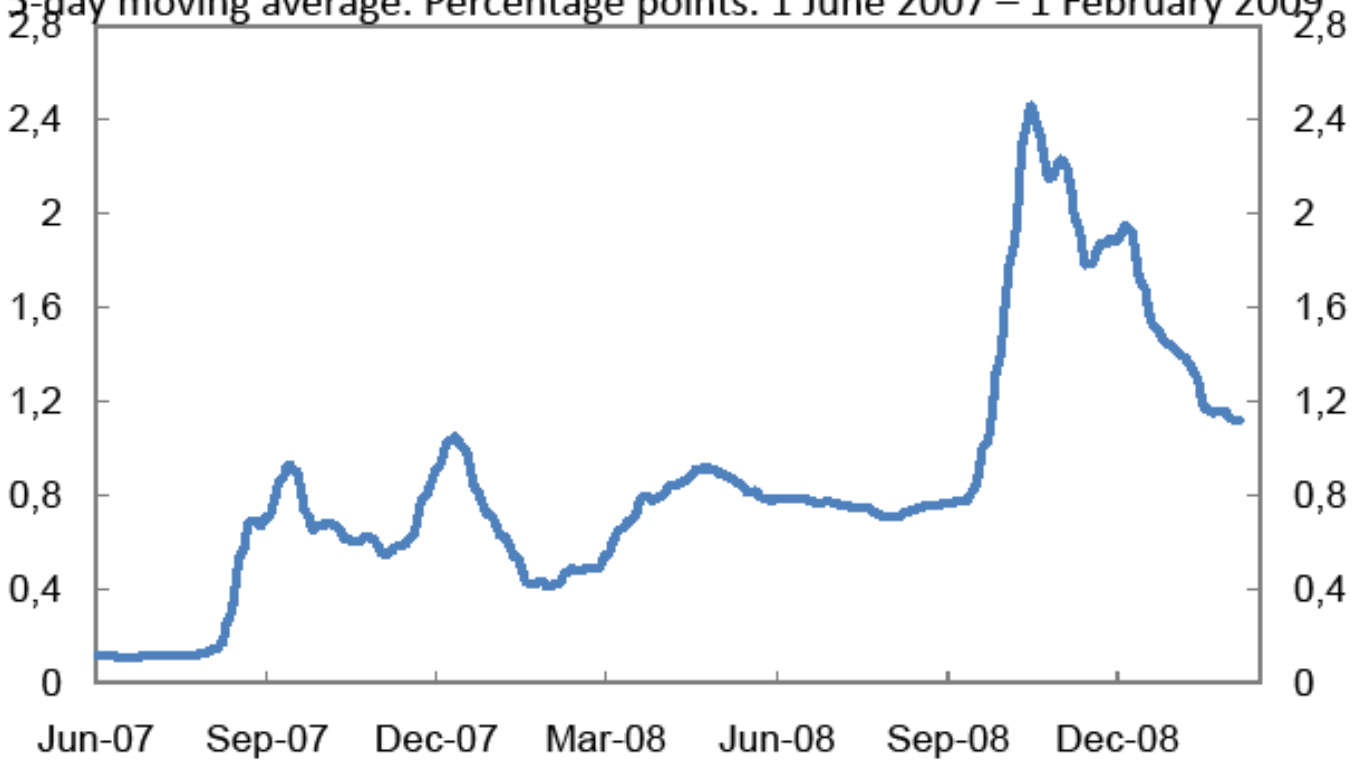
1

Kilde: Thomson Reuters

External finance premium

Premiums in international money markets[1)]

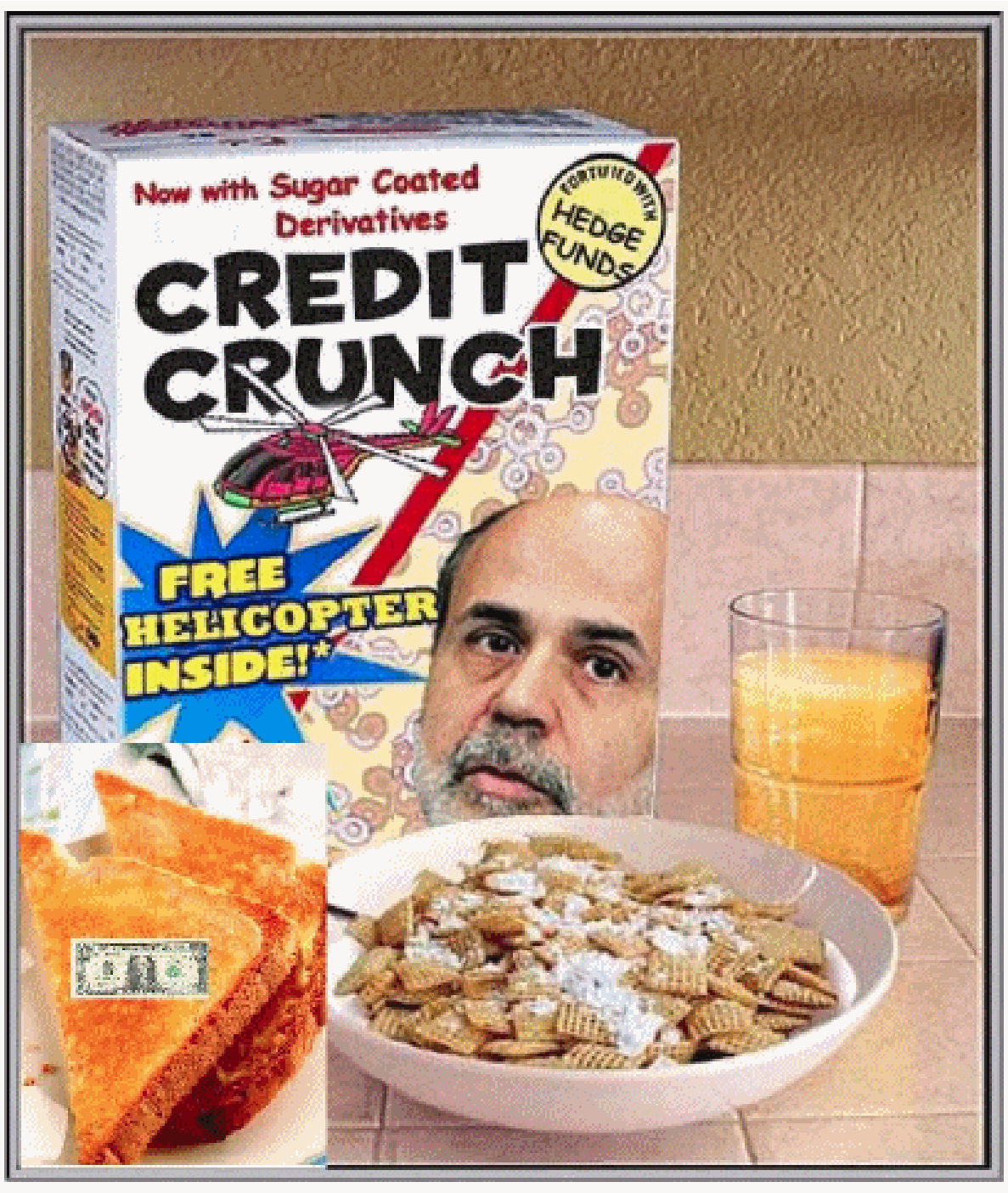
5-day moving average. Percentage points. 1 June 2007 – 1 February 2009



1) Average of the spread between 3-month money market rates and expected key rates in the US, UK and euro area.

Source: Thomson Reuters

]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Minutes from last FOMC-meeting:

- "The Federal Reserve will employ all available tools to promote the resumption of sustainable economic growth and to preserve price stability. The focus of the Committee's policy is to support the functioning of financial markets and stimulate the economy through open market operations and other measures that are likely to keep the size of the Federal Reserve's balance sheet at a high level".

- "The Federal Reserve continues to purchase large quantities of agency debt and mortgage-backed securities to provide support to the mortgage and housing markets, and it stands ready to expand the quantity of such purchases and the duration of the purchase program as conditions warrant. The Committee also is prepared to purchase longer-term Treasury securities if evolving circumstances indicate that such transactions would be particularly effective in improving conditions in private credit markets."

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- Next time: interpretation of this - alternatives to using policy rate available to central banks? Is this monetary policy?

- Literature, next time:

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  - "The Financial Accelerator in a quantitative business cycle framework", Ben S. Bernanke, Mark Gertler and Simon Gilchrist, Handbook of Macroeconomics, Vol. 1, 1999 (eds: J. B. Taylor and M. Woodford)

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