

# **Impact of Moral Hazard on Credit Risk**

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# Moral Hazard Causes Credit Risk

Fundamental Reason: Information Asymmetric

- Counterparty with information superiority: opportunism behavior.
- Counterparty with information inferiority: infringe of interest



## Assumption (1)

- Invest funds  $x$  into projects.

Project  $A$  brings benefits  $x\delta_A$  with probability  $P_A$ . Distribution and density function of  $\delta_A$  is  $\Phi(\cdot)$  and  $\varphi(\cdot)$  respectively.

Project  $B$  brings benefits  $\tau$ , which is randomly distributed in  $[0, x\delta_B]$ . Conditional distribution and density function is  $F(\tau|x)$  and  $f(\tau|x)$ .



## Assumption (2)

- Default occurs when the investment fails.
- Probability of default rise with interest rate if the interest rate is sufficiently high (high enough).



## Basic Model

- Following the assumptions, the risk of project  $A$  is higher than the risk of project  $B$ .
- High risk project  $B$  can not get the loan directly.
- Borrower has motivation to borrow money through low risk project from banks but invest this money into high risk project.



For borrower the moral hazard occurs if and only if the expected return of project  $A$  is higher than the expected return of project  $B$ .

i.e. 
$$V_A(x_B) = P_A[x_B\theta_A - x_B(1+r)] > \beta - (r+1)x_B - \int_{x_B(1+r)}^{\beta} F(\tau|x_B)d\tau = V_B(x_B),$$



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The probability of moral hazard is

$$P_M = 1 - \Phi(H(r)),$$

In which 
$$\frac{\beta - x_B(1+r)(1 - P_A) - \int_{x_B(1+r)}^{\beta} F(\tau|x_B)d\tau}{P_A x_B} = H(r),$$



**Proposition 1: The probability of moral hazard is increase on the interest rate.**





# Impact of moral hazard on credit risk

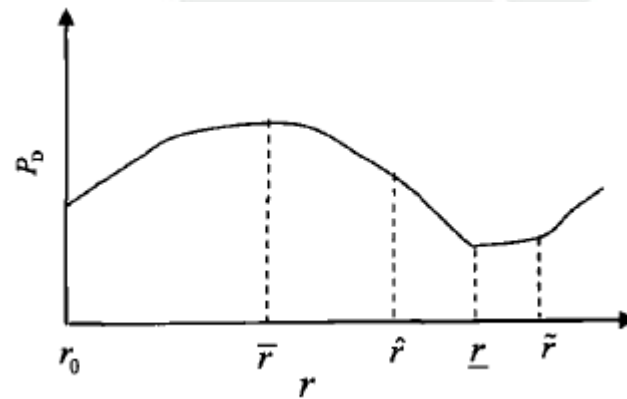
Relationship between probability of moral hazard and default:

$$P_D = P_M(1 - P_A) + (1 - P_M)F(x(1 + r) | x),$$



## Static analysis

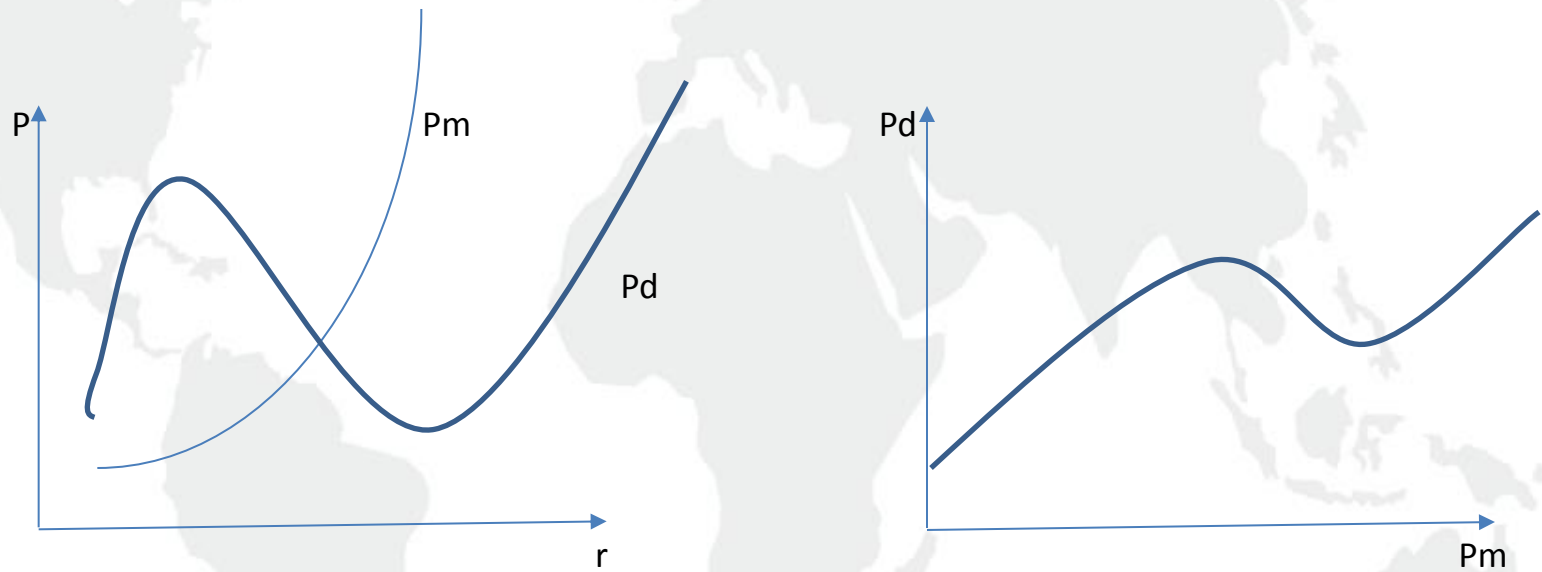
Relationship between probability of default and interest rate



**Proposition 2: The relationship between probability of default and probability of moral hazard is nonlinear. There exist two interest rates that can maximize and minimize the probability of default.**



# Numerical analysis



Thank You

