



## Chapter 4.2

### Quality of securities issued

# Outline

- Problem and model assumptions
- Direct trade
- Investment bank intermediation
- Comparing direct trade and investment banks
- Summary

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## Issuers affecting security quality

- ▶ Issuers can affect the value of their securities
- ▶ Increasing the value (quality) will be costly to issuers and needs to be balanced against the higher revenue from selling securities
- ▶ Better information about the quality by buyers might lead to a stronger reaction of the selling price
- ▶ If investment banks are better informed, they might increase the quality of securities sold

# Model assumptions

- ▶ The security can be of high or low value,  $V_i$ , and the issuer knows the type of security it sells
- ▶ The buyer only knows the issuer has security  $H$  with probability  $p$
- ▶ Buyers can obtain the security directly or through an investment bank
- ▶ Buyers and investment banks receive a signal  $s \in \{H, L\}$
- ▶ Signal has precision  $Prob(s = H|H) = Prob(s = L|L) = p_j$
- ▶ Investment banks have more precise information than direct buyers  $p_B > p_D > \frac{1}{2}$

# Bayesian learning

- ▶ The probability of the actual quality of the security, given and the observed signal being identical is  $p_j^s$
- ▶  $Prob(H|s = H) = p_j^H = \frac{pp_j}{pp_j + (1-p)(1-p_j)}$
- ▶  $Prob(L|s = L) = p_j^L = \frac{(1-p)p_j}{(1-p)p_j + p(1-p_j)}$
- ▶ We find  $p_B^H > p_D^H > p > p_D^L > p_B^L$

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# Expected value to the buyer

- ▶ Buyers will use their signal to assess the value of the security
- ▶ If receiving the high signal, the security is worth  $V_H$  if the signal is correct and  $V_L$  if it is incorrect
- ▶  $E_D [V|H] = p_D^H V_H + (1 - p_D^H) V_L$
- ▶ If receiving the low signal, the security is worth  $V_L$  if the signal is correct and  $V_H$  if it is incorrect
- ▶  $E_D [V|L] = p_D^L V_L + (1 - p_D^L) V_H$

# Competitive prices and profits

- ▶ The profits of the buyer are  $\Pi_C^s = E_D [V|s] - P_s$
  - ▶ Competition between buyers eliminates all profits:  $\Pi_C^s = 0$
- $\Rightarrow P_s = E_D [V|s]$
- ▶ The signal is high with probability  $p$  and low with probability  $1 - p$
  - ▶ The costs  $C$  ensure the security quality  $p$  is achieved
  - ▶ The seller profits are then  $\Pi_S = pP_H + (1 - p) P_L - C$

# Optimal security quality

- ▶ The seller's optimal security quality maximizes his profits, thus we need  $\frac{\partial \Pi_S}{\partial p} = 0$
- ⇒  $\frac{\partial C}{\partial p} = (P_H - P_L) + p \frac{\partial P_H}{\partial p} + (1 - p) \frac{\partial P_L}{\partial p}$
- ▶ The right hand side is zero for  $p = 0$  and  $p = 1$  and maximal at  $p = \frac{1}{2}$

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# Competition between direct buyers and investment banks

- ▶ The expected value of the security to the investment bank can be determined similarly to that of direct buyers
- ▶  $E_B [V|H] = p_B^H V_H + (1 - p_B^H) V_L$
- ▶  $E_B [V|L] = p_B^L V_L + (1 - p_B^L) V_H$
- ⇒  $E_B [V|H] > E_D [V|H] > E_D [V|L] > E_B [V|L]$
- ▶ As  $E_D [V|L] > E_B [V|L]$  the investment bank will not be able to compete with the direct buyer if a low signal  $L$  is received
- ▶ As  $E_B [V|H] > E_D [V|H]$  the investment bank can pay more than a direct buyer if a high signal  $H$  is received

# Seller profits

- ▶ If the value is high, the seller receives  $\hat{P}_H = E_B [V|H]$
- ▶ If the value is low, the seller receives  $\hat{P}_L = E_B [V|L]$  if the signal is correct
- ▶ If the signal is not correct, they obtain  $\hat{P}_H$
- ▶ Issuers face costs to achieve the security quality  $p$
- ▶ The expected profits are  $\hat{\Pi}_S = p\hat{P}_H + (1 - p) \left( p_B\hat{P}_L + (1 - p_B) \hat{P}_H \right) - C$

# Optimal security quality

- ▶ The seller's optimal security quality maximizes his profits, thus we need  $\frac{\partial \Pi_S}{\partial p} = 0$

$$\Rightarrow \frac{\partial C}{\partial p} = p_B \left( \hat{P}_H - \hat{P}_L \right) + p \frac{\partial \hat{P}_H}{\partial p} + (1 - p) \frac{\partial \hat{P}_L}{\partial p} \\ + (1 - p) (1 - p_B) \frac{\partial \hat{P}_H}{\partial p}$$

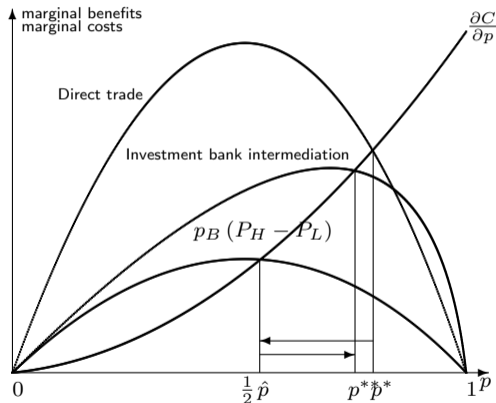
- ▶ The first line is similar to the condition for direct trade and has the same properties
- ▶ The second line is positive and shifts the maximum of this expression to  $p > \frac{1}{2}$

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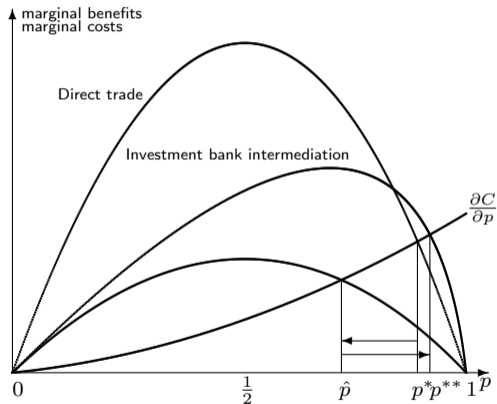
# Effect of introducing investment banks

- ▶ The first line can be larger or smaller than in direct trade, if investment banks are highly skilled (high  $p_B$ ) this is likely to be larger
- ▶ If it is larger, then as the second line is positive, marginal costs are higher, hence security quality is higher
- ▶ If it is smaller, then the change of quality when introducing an investment bank depends on the magnitude of these effects

# Reduced security quality with high marginal costs



# Increased security quality with low marginal costs



# Analysing the effects

- ▶ Focus only on the first terms of the first order condition and take the difference:  

$$(P_H - P_L) - p_B (\hat{P}_H - \hat{P}_L)$$
- ▶ This can be rewritten as  $(1 - p_B) (P_H - P_L) + p_B \left( (P_H - P_L) - (\hat{P}_H - \hat{P}_L) \right)$
- ▶ The first term shows the additional revenue to the seller from misidentifying low-quality securities as high quality, this reduces security quality
- ▶ The second term shows the differences in value for high-quality and low-quality securities, which widens with investment banks, increasing security quality

## Combined effect

- ▶ If marginal costs are low, the impact of having larger differences in values between securities in the presence of investment banks dominates and security quality increases
- ▶ If marginal costs are high, the impact of misidentifying the quality of securities dominates and security quality decreases

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# Investment banks do not always increase security quality

- ▶ The higher ability of investment banks to identify the quality of securities, gives incentives to issuers to improve the security quality
- ▶ The effect is, however, not guaranteed if the ability of the bank is relatively low
- ▶ In this case, a secondary effect can dominate, that misidentification of low-quality securities gives incentives to lower the quality of securities

# Instances of lower security quality with investment banks

- ▶ A lowering of security quality might occur if the issuer is difficult to assess for investment banks (low  $p_B$ )
- ▶ This might also happen if the buyers are highly skilled (high  $p_D$ )
- ▶ Small differences in values ( $V_H - V_L$ ), will also reduce incentives to increase security quality



This presentation is based on  
Andreas Krause: Theoretical Foundations of Investment Banking, Springer Verlag 2024  
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