Andreas Krause



Chapter 4.2 Quality of securities issued

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Issuers can affect the value of their securities

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- Issuers can affect the value of their securities
- Increasing the value (quality) will be costly to issuers

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Model assumptions				

The security can be of high or low value, V_i, and the issuer knows the type of security it sells

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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

Problem and assumptions	Direct trade	Investment banks	Comparison	Summary
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Model assumptions				

- The security can be of high or low value, V_i, and the issuer knows the type of security it sells
- \blacktriangleright The buyer only knows the issuer has security H with probability p
- Buyers can obtain the security directly

Problem and assumptions	Direct trade	Investment banks	Comparison	Summary
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Model assumptions				

- The security can be of high or low value, V_i , and the issuer knows the type of security it sells
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- Buyers can obtain the security directly or through an investment bank

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- Buyers can obtain the security directly or through an investment bank
- Buyers and investment banks receive a signal $s \in \{H, L\}$

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- Investment banks have more precise information than direct buyers

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Bayesian learning

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Bayesian learning				

The probability of the actual quality of the security, given and the observed signal being identical is p^s_j

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Bayesian learning				

The probability of the actual quality of the security, given and the observed signal being identical is p^s_j

▶
$$Prob(H|s = H) = p_j^H = \frac{pp_j}{pp_j + (1-p)(1-p_j)}$$

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Problem and assumptions	Direct trade	Investment banks	Comparison	Summary
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Bayesian learning				

The probability of the actual quality of the security, given and the observed signal being identical is p^s_i

▶
$$Prob(H|s = H) = p_j^H = \frac{pp_j}{pp_j + (1-p)(1-p_j)}$$

▶ $Prob(L|s = L) = p_j^L = \frac{(1-p)p_j}{(1-p)p_j} + p(1-p_j)$

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Bayesian learning				

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Expected value to	the buyer			

Buyers will use their signal to assess the value of the security

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Expected value t	to the buyer			

- Buyers will use their signal to assess the value of the security
- \blacktriangleright If receiving the high signal, the security is worth V_H if the signal is correct

 $\blacktriangleright E_D[V|H] = p_D^H V_H$

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Problem and assumptions	Direct trade	Investment banks	Comparison	Summary
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Expected value t	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
- $\blacktriangleright E_D[V|H] = p_D^H V_H + (1 p_D^H) V_L$

Problem and assumptions	Direct trade	Investment banks	Comparison	Summary
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- Buyers will use their signal to assess the value of the security
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$$E_D[V|H] = p_D^H V_H + (1 - p_D^H) V_L$$

 \blacktriangleright If receiving the low signal, the security is worth V_L if the signal is correct

$$\blacktriangleright E_D\left[V|L\right] = p_D^L V_L$$

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Problem and assumptions	Direct trade	Investment banks	Comparison	Summary
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Competitive prices and profits

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Competitive prices and profits

• The profits of the buyer are $\Pi_C^s = E_D \left[V | s \right] - P_s$

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- The profits of the buyer are $\Pi_C^s = E_D [V|s] P_s$
- Competition between buyers eliminates all profits: $\Pi_C^s = 0$

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- Competition between buyers eliminates all profits: $\Pi_C^s = 0$
- $\Rightarrow P_{s} = E_{D}\left[V|s\right]$
- \blacktriangleright The signal is high with probability p and low with probability 1-p
- The seller profits are then $\Pi_S = pP_H + (1-p)P_L$

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- \blacktriangleright The signal is high with probability p and low with probability 1-p
- \blacktriangleright The costs C ensure the security quality p is achieved
- The seller profits are then $\Pi_S = pP_H + (1-p)P_L C$

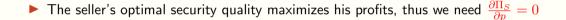
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► The seller's optimal security quality maximizes his profits, thus we need $\frac{\partial \Pi_S}{\partial p} = 0$ $\Rightarrow \frac{\partial C}{\partial p} = (P_H - P_L) + p \frac{\partial P_H}{\partial p} + (1 - p) \frac{\partial P_L}{\partial p}$

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

$$\Rightarrow \frac{\partial C}{\partial p} = (P_H - P_L) + p \frac{\partial P_H}{\partial p} + (1 - p) \frac{\partial P_L}{\partial p}$$

• The right hand side is zero for p = 0 and p = 1

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The expected value of the security to the investment bank can be determined similarly to that of direct buyers

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- The expected value of the security to the investment bank can be determined similarly to that of direct buyers
- $E_B[V|H] = p_B^H V_H + (1 p_B^H) V_L$
- $E_B[V|L] = p_B^L V_L + (1 p_B^L) V_H$

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- The expected value of the security to the investment bank can be determined similarly to that of direct buyers
- $E_B[V|H] = p_B^H V_H + (1 p_B^H) V_L$
- $E_B[V|L] = p_B^L V_L + (1 p_B^L) V_H$
- $\Rightarrow E_B\left[V|H\right] > E_D\left[V|H\right] > E_D\left[V|L\right] > E_B\left[V|L\right]$

<u> </u>	Problem and assumptions	Direct trade 0000	Investment banks 0●00	Comparison 000000	Summary 0000
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- $E_B[V|L] = p_B^L V_L + (1 p_B^L) V_H$
- $\Rightarrow E_B[V|H] > E_D[V|H] > E_D[V|L] > E_B[V|L]$
- ► 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

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- 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

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- The expected value of the security to the investment bank can be determined similarly to that of direct buyers
- $E_B[V|H] = p_B^H V_H + (1 p_B^H) V_L$
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Seller profits				

▶ If the value is high, the seller receives $\hat{P}_H = E_B [V|H]$

• The expected profits are
$$\hat{\Pi}_S = p \hat{P}_H$$

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- 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

• The expected profits are
$$\hat{\Pi}_S = p \hat{P}_H + (1-p) \left(p_B \hat{P}_L \right)$$

Problem and assumptions	Direct trade	Investment banks	Comparison	Summary
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- ▶ 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

• The expected profits are
$$\hat{\Pi}_S = p\hat{P}_H + (1-p)\left(p_B\hat{P}_L + (1-p_B)\hat{P}_H\right)$$

Problem and assumptions	Direct trade	Investment banks	Comparison	Summary
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- ▶ 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
- \blacktriangleright Issuers face costs to achieve the security quality p
- The expected profits are $\hat{\Pi}_S = p\hat{P}_H + (1-p)\left(p_B\hat{P}_L + (1-p_B)\hat{P}_H\right) C$

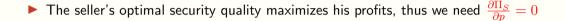
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- ▶ If the value is high, the seller receives $\hat{P}_H = E_B \left[V | H \right]$
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Optimal security	quality			



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► The seller's optimal security quality maximizes his profits, thus we need $\frac{\partial \Pi_S}{\partial p} = 0$ $\Rightarrow \frac{\partial C}{\partial p} = p_B \left(\hat{P}_H - \hat{P}_L \right) + p \frac{\partial \hat{P}_H}{\partial p} + (1-p) \frac{\partial \hat{P}_L}{\partial p}$ $+ (1-p) (1-p_B) \frac{\partial \hat{P}_H}{\partial p}$

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- The seller's optimal security quality maximizes his profits, thus we need ∂^Π_S/∂p = 0
 ⇒ ∂C/∂p = p_B (P̂_H P̂_L) + p∂P̂_H/∂p + (1 p) ∂P̂_L/∂p + (1 - p) (1 - p_B) ∂P̂_H/∂p
 The first line is similar to the condition for direct trade and has the same
 - The first line is similar to the condition for direct trade and has the s properties

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- 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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- ► 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
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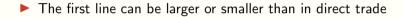
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Effect of introducing investment banks

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Effect of introducing investment banks



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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

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- 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

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- 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

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- 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

<u> </u>	Problem and assumptions	Direct trade 0000	Investment banks 0000	Comparison 00000	Summary 0000
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- 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

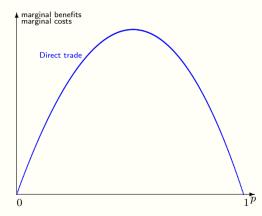
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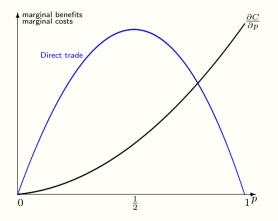
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marginal benefits marginal costs $\overline{1^p}$ 0

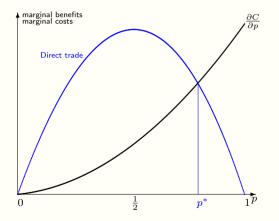
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Problem and assumptions	Direct trade	Investment banks	Comparison	Summary
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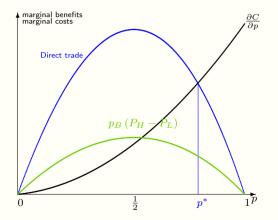


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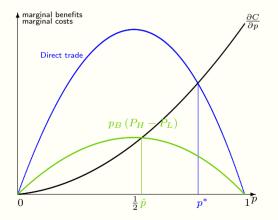


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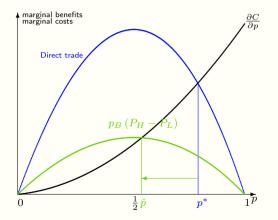
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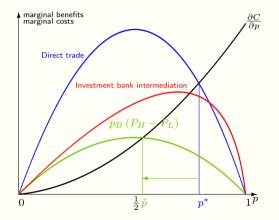
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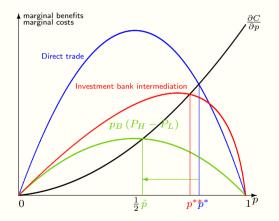
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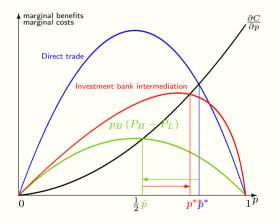
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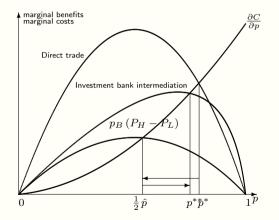
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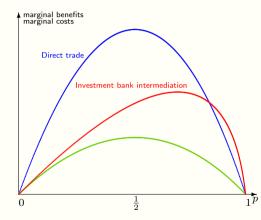
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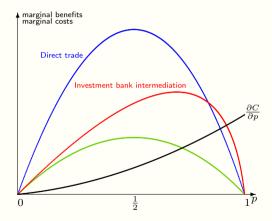
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Problem and assumptions	Direct trade	Investment banks	Comparison	Summary
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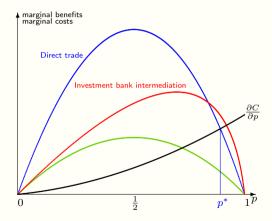


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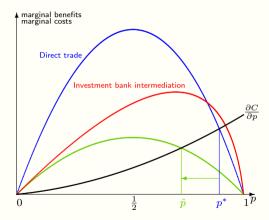
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Problem and assumptions	Direct trade	Investment banks	Comparison	Summary
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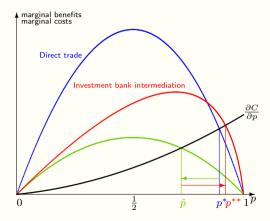


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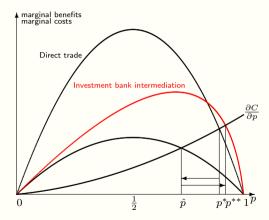
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Problem and assumptions	Direct trade	Investment banks	Comparison	Summary
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Problem and assumptions	Direct trade	Investment banks	Comparison	Summary
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Problem and assumptions	Direct trade	Investment banks	Comparison	Summary
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Problem and assumptions	Direct trade	Investment banks	Comparison	Summary
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Analysing the effect	cts			

Focus only on the first terms of the first order condition and take the difference: $(P_H - P_L) - p_B \left(\hat{P}_H - \hat{P}_L \right)$

Problem and assumptions	Direct trade	Investment banks	Comparison	Summary
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- Focus only on the first terms of the first order condition and take the difference: $(P_H - P_L) - p_B \left(\hat{P}_H - \hat{P}_L \right)$
- ► This can be rewritten as $(1 p_B)(P_H P_L) + p_B\left((P_H P_L) (\hat{P}_H \hat{P}_L)\right)$

Problem and assumptions	Direct trade	Investment banks	Comparison	Summary
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- Focus only on the first terms of the first order condition and take the difference: $(P_H - P_L) - p_B \left(\hat{P}_H - \hat{P}_L \right)$
- ▶ This can be rewritten as $(1 p_B)(P_H P_L) + p_B((P_H P_L) (\hat{P}_H \hat{P}_L))$

The first term shows the additional revenue to the seller from misidentifying low-quality securities as high quality

Problem and assumptions	Direct trade	Investment banks	Comparison	Summary
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- Focus only on the first terms of the first order condition and take the difference: $(P_H - P_L) - p_B \left(\hat{P}_H - \hat{P}_L \right)$
- ▶ 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

Problem and assumptions	Direct trade	Investment banks	Comparison	Summary
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- Focus only on the first terms of the first order condition and take the difference: $(P_H - P_L) - p_B \left(\hat{P}_H - \hat{P}_L \right)$
- ▶ 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

Problem and assumptions	Direct trade	Investment banks	Comparison	Summary
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- Focus only on the first terms of the first order condition and take the difference: $(P_H - P_L) - p_B \left(\hat{P}_H - \hat{P}_L \right)$
- ▶ 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

Problem and assumptions	Direct trade	Investment banks	Comparison	Summary
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- Focus only on the first terms of the first order condition and take the difference: $(P_H - P_L) - p_B \left(\hat{P}_H - \hat{P}_L \right)$
- ▶ 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

Problem and assumptions	Direct trade	Investment banks	Comparison	Summary
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Combined effect

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Problem and assumptions	Direct trade	Investment banks	Comparison	Summary
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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

Problem and assumptions	Direct trade 0000	Investment banks 0000	Comparison	Summary 0000

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

Problem and assumptions	Direct trade	Investment banks	Comparison	Summary
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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

Problem and assumptions	Direct trade	Investment banks	Comparison	Summary
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Problem and model assumptions

Direct trade

Investment bank intermediation

Comparing direct trade and investment banks

Summary

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Problem and assumptions	Direct trade	Investment banks	Comparison	Summary
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The higher ability of investment banks to identify the quality of securities, gives incentives to issuers to improve the security quality

Problem and assumptions	Direct trade	Investment banks	Comparison	Summary
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- 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

Problem and assumptions	Direct trade	Investment banks	Comparison	Summary
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- 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

Problem and assumptions	Direct trade	Investment banks	Comparison	Summary
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- 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

Problem and assumptions	Direct trade	Investment banks	Comparison	Summary
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Problem and assumptions	Direct trade	Investment banks	Comparison	Summary
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A lowering of security quality might occur if the issuer is difficult to assess for investment banks (low p_B)

Problem and assumptions	Direct trade	Investment banks	Comparison	Summary
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- 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)

Problem and assumptions Direct trade Investment banks Comparison Summary 0000 0000 0000 0000 00000 00000	Problem and assumptions				Summary 00●0
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- 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

Problem and assumptions Direct trade Investment banks Comparison Summary 0000 0000 0000 0000 00000 00000	Problem and assumptions				Summary 00●0
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- 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



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